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March 23, 2011

Brandon Perkins, Task Monitor United States Environmental Protection Agency 1200 Sixth Avenue, Mail Stop ECL-112 Seattle, Washington 98101

Re: Contract Number: EP-S7-06-02

Technical Direction Document Number: 10-05-0004 Final South Tacoma Channel Seep Site Inspection Report

Dear Mr. Perkins:

Enclosed please find the *Final Site Inspection Report for the South Tacoma Channel Seep*, which is located in Tacoma, Washington. If you have any question regarding this submittal, please call me at (206) 624-9537.

Sincerely,

ECOLOGY AND ENVIRONMENT, INC.

Lindo E. Castello

Linda Costello

START-3 Project Leader

cc: Jeff Fetters, Project Manager, E & E, Seattle, Washington

South Tacoma Channel Seep Site Inspection Report Tacoma, Washington

March 2011

Prepared for: UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

1200 Sixth Avenue Suite 900, Mail Stop ECL-112 Seattle, Washington 98101

Prepared by:

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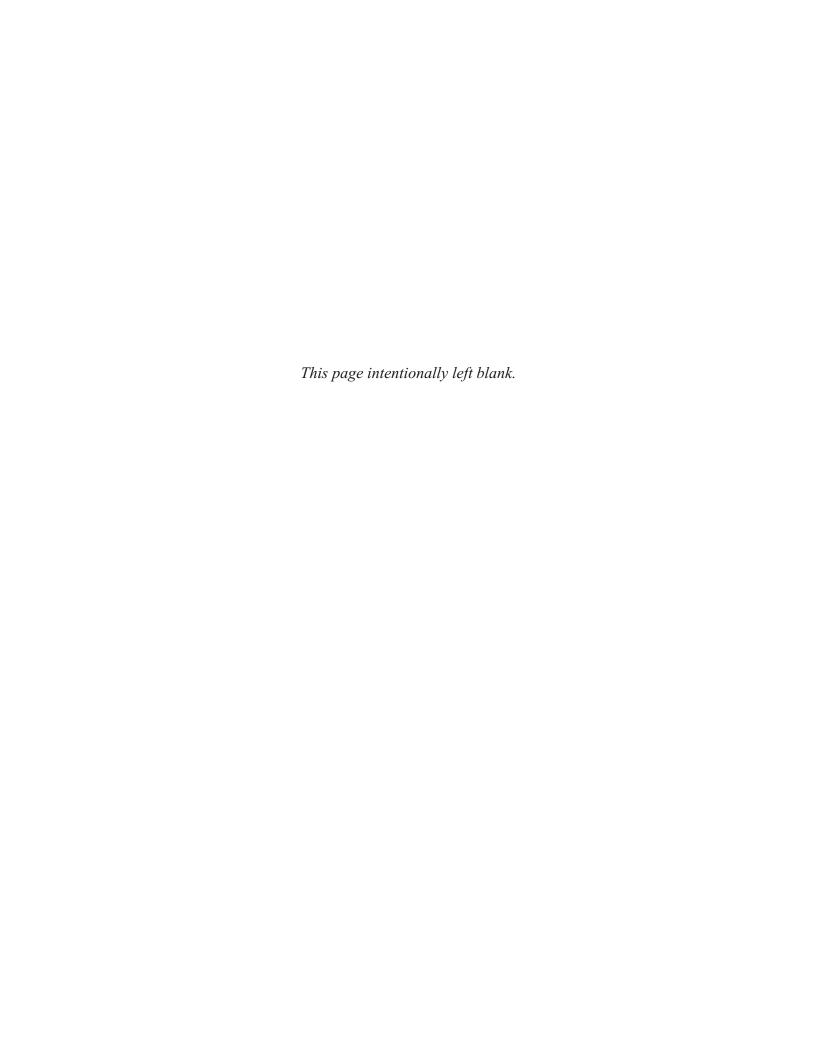
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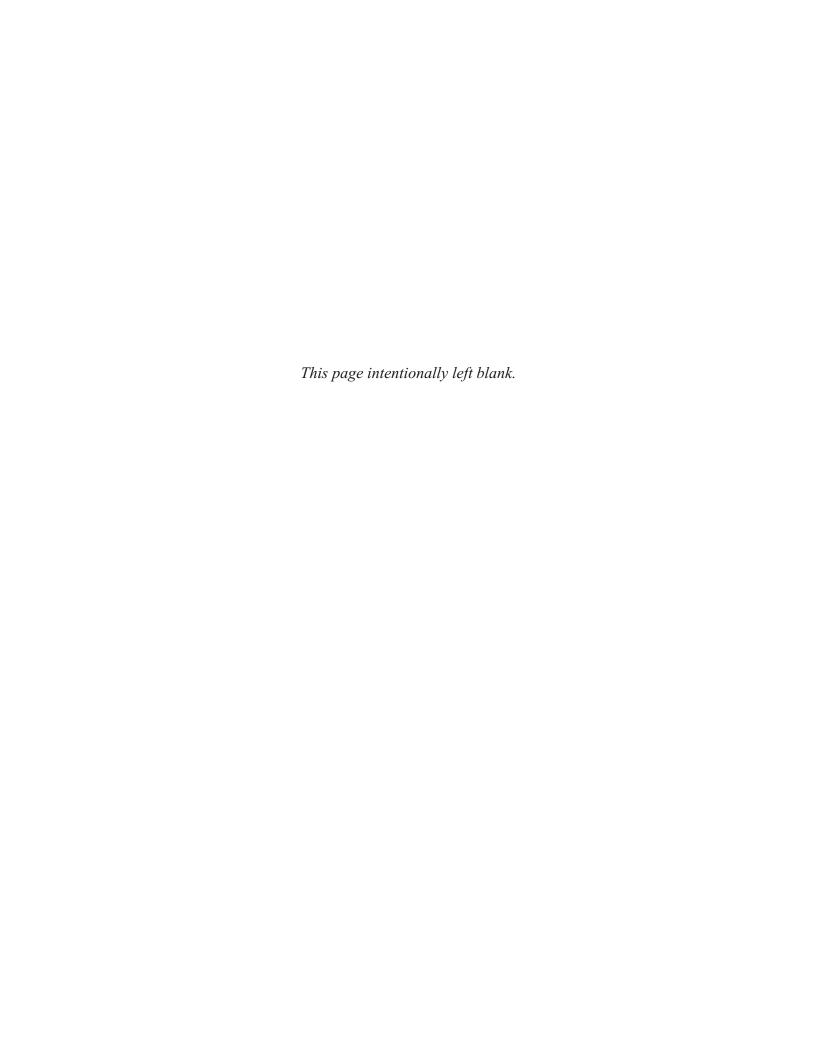
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Acronym Definition

%R percent recovery

BNSF Burlington Northern Santa Fe (Railway Corporation)

BS Blank Spike

CERCLA Comprehensive Emergency Response and Compensation Liability Act

CLP Contract Laboratory Program

CRQL Contract Required Quantitation Limit

DCE trans-1,2-dichloroethene

DOH (Washington State) Department of Health

DQO Data Quality Objective

E & E Ecology and Environment, Inc.

Ecology Washington State Department of Ecology

EPA United States Environmental Protection Agency.

FFS Focused Feasibility Study

FS Feasibility Study gpm gallons per minute

GPS Global Positioning System
IDW Investigative Derived Waste
MCL maximum contaminant level

MEL Manchester Environmental Laboratory
MS/MSD Matrix Spike/Matrix Spike Duplicate

NPL National Priorities List

OUs Operable Units

PA Preliminary Assessment

PCA tetrachloroethane

PCB polychlorinated biphenyl

PCE tetrachloroethene
PM Project Manager
ppb parts per billion
ppm parts per million
QA Quality Assurance
QC Quality Control

RI Remedial Investigation ROD Record of Decision

RPD Relative Percent Difference

SI Site Inspection SOW Scope of Work

SPAF Sample Plan Alteration Form SQL Sample Quantitation Limit

List of Abbreviations and Acronyms (cont.)

START Superfund Technical Assessment and Response Team

SVOC semivolatile organic compound

TA Central Puget Sound Regional Transit Authority

Tacoma Seep South Tacoma Channel Seep

TAL Target Analyte List TCE trichloroethene

TDL Target Distance Limit

TM Task Monitor

TPCHD Tacoma Pierce County Health District
TPH-D total petroleum hydrocarbons as diesel
TPH-G total petroleum hydrocarbons as gasoline

μg/L Micrograms per Liter

VOCs volatile organic compounds

WAC Washington Administrative Code

Introduction

Ecology and Environment, Inc. (E & E), was tasked by the United States Environmental Protection Agency (EPA) to provide technical support for completion of a Site Inspection (SI) at the South Tacoma Channel Seep (Tacoma Seep) site in Tacoma, Washington (Figure 1-1). The SI was planned to be conducted in two phases, with the results of Phase I determining whether a Phase II would be necessary. E & E completed SI activities under Technical Direction Document Number 10-05-0004, issued under EPA, Region 10, Superfund Technical Assessment and Response Team (START)-3 Contract No. EP-S7-06-02.

The specific goals for the Phase I South Tacoma SI identified by the EPA are:

- Determine the potential threat to public health or the environment posed by the site;
- Determine the potential for a release of hazardous constituents into the environment; and
- Determine the potential for placement of the site on the National Priorities List.

The specific goals for the Phase II South Tacoma SI, if determined to be necessary, are similar to the goals of the Phase I SI listed above. However, the Phase II SI was intended to build on the Phase I SI fieldwork by:

- Conducting source sampling near potential contaminant sources within the Target Distance Limit (TDL); and
- Determine if potential contaminant sources within the TDL may be contributing to ground water contamination near the site.

Completion of the SI included reviewing existing site information, determining regional characteristics, collecting receptor information within the range of site influence, executing a sampling plan, and producing this report. The report is organized as follows:

- Section 1, Introduction Authority for performance of this work, goals for the project, and summary of the report contents;
- Section 2, Background site description, site operations and waste characteristics, and a summary of investigation locations;
- Section 3, Field Activities and Analytical Protocol Summary of the field effort;
- Section 4, Quality Assurance (QA)/Quality Control (QC) Summary of the laboratory data;



- Section 5, Analytical Results Reporting and Background Samples Discussion of results reporting criteria and background sample locations and analytical results;
- Section 6, Potential Sources Discussion of site sources, sample locations, and analytical results;
- Section 7, Migration/Exposure Pathways and Targets Discussion of the migration/exposure pathways, sample locations, and analytical results;
- Section 8, Summary and Conclusions Summary of the investigation and recommendation for the site based on the information gathered during the investigation; and

1-2

• Section 9, References – Alphabetical listing of the references cited throughout the text.

Site Background

This section describes the background of the site, including location, description, ownership history, operations and source characteristics, previous investigations, and a summary of the site investigation locations.

2.1 Site Location

Site Name:	South Tacoma Channel Seep
CERCLIS ID Number:	WAN001002824
Site Address:	Near 800 block of South Tacoma Way
Latitude:	47.23195 North
Longitude:	-122.44711 West
Legal Description:	Range 3 East, Township 20 North, Section 8
County:	Pierce
Congressional District:	9
Site Owner(s):	Central Puget Sound Regional Transit
	Authority
	401 South Jackson Street
	Seattle, Washington 98104

2.2 Site Description

The Tacoma Seep is a naturally occurring ground water seep located in the 800 block of South Tacoma Way in Tacoma, Washington (Figure 2-1). The seep is located approximately 1 mile southwest of the Thea Foss Waterway and north of Interstate 5, which is north of a residential area. Further, the seep is located south of a commercial area, approximately 0.18 miles east of South M Street and north of South Tacoma Way.

The seep is reported to be used as a drinking water source by indigent people (Perkins 2009). The seep was identified during sampling conducted in 2005 by the Washington State Department of Ecology (Ecology), who sampled the Tacoma seep as part of continuing ground water monitoring for the Commencement Bay–South Tacoma Channel Superfund Sites. During this sampling project, volatile organic compound (VOC) contamination was detected in the seep. The Commencement Bay–South Tacoma Channel Superfund Sites, the Thea Foss Waterway, and their relationship to the South Tacoma Channel Seep are discussed in further detail below in Section 2.4.2.



2.3 Site Ownership History

The seep is located on property currently owned by the Central Puget Sound Regional Transit Authority (TA). The property was purchased from the Burlington Northern Santa Fe Railway Corporation (BNSF) on September 28, 2004, as part of the Tacoma to Lakewood Commuter Rail Project. Information regarding ownership history prior to this transfer could not be located; however, based on a license agreement between Central Puget Sound Regional Transit Authority and the City of Tacoma, it appears that BNSF owned the property from at least 1961 (the year that a permit was issued to BNSF by the City of Tacoma) to 2004, when the TA acquired the property (City of Tacoma 2007; Pierce County 2010).

2.4 Site Operations and Source Characteristics

The seep emerges from a pipe located on the south side of a former rail line (Figure 2-1). The seep was discovered by Ecology in 2005. During that sampling event, water was collected from the seep and analyzed for VOCs by EPA Method 8260 at the EPA Manchester Environmental Laboratory in Manchester, Washington. The initial sample results indicated the presence of VOCs, including trichloroethylene (TCE) at a concentration that exceeded the EPA Safe Drinking Water Act maximum contaminant level (MCL) of 5 micrograms per liter (μ g/L). The seep was sampled a second time in June 2008, though it is unclear who performed this sampling. These sample results also indicated the presence of TCE at a concentration that exceeded the MCL (Colman (2011). Water from the seep has been analyzed only for VOCs and not for other analytical suites.

A records search revealed a known VOC ground water plume located in the area of the site. It is possible that this plume is related to contamination at the Tacoma Seep site. This plume has been investigated as a part of the Commencement Bay—South Tacoma Channel Superfund Sites. The plume may also have some connection with the Commencement Bay—Nearshore/Tideflats Site, which is located near the Tacoma Seep site. Although the nearest source areas related to this site are associated with metals, semivolatile organic compounds (SVOCs), and polychlorinated biphenyls (PCBs); rather than VOCs, these sources may be related to any such contaminants discovered at the seep during this SI.

2.4.1 Commencement Bay – South Tacoma Channel Superfund Sites

The Commencement Bay – South Tacoma Channel Superfund Sites encompass a 2.5-square-mile area in Tacoma, Washington (Figure 2-2). These sites have been subdivided into three distinct project areas to facilitate management. The three project areas, also referred to as Operable Units (OUs), are the Tacoma Landfill, the South Tacoma Field, and Well 12A. The sites were proposed for listing on the National Priorities List (NPL) in December 1982 and finalized for listing in September 1983. The project area that is nearest to the Tacoma Seep site is Well 12A, which is approximately 1.3 miles south-southwest of the seep. The other two OUs are sufficiently distant from the site that they are not expected to be affecting, or be affected by, the Tacoma Seep site. For this reason, these two OUs are not further discussed (EPA 2010).



The Well 12A OU includes the contaminated well and the source of contamination to the well, the former Time Oil Company (Figure 2-3). Well 12A is located on Pine Street between 38th Avenue and South Tacoma Way. Current land use around well 12A is commercial and industrial (EPA 2008a).

Ground water in the area is used as a drinking water source for the City of Tacoma. Well 12A is one of 13 wells operated by the City of Tacoma in a well field that provides approximately 40% of the summer drinking water supply to the city. The dominant ground water flow direction is to the southwest when drinking water wells are producing and to the northeast when they are not producing. Well 12A is located within the South Tacoma Ground Water Protection District, which is a special zoning overlay district managed by the Tacoma Pierce County Health Department (TPCHD) (EPA 2008a).

Site Discovery:

On four different occasions between July and September 1981, chlorinated organic solvents were detected in Well 12A in parts per billion (ppb) concentrations that were above drinking water criteria. As a result, the City of Tacoma Water Department removed Well 12A from production in September 1981 (EPA 2008a).

Phase I Remedial Investigation:

A Remedial Investigation (RI) was conducted in April 1982 to determine the source, type, and extent of contamination at Well 12A. Eleven ground water monitoring wells were installed, and the results of subsequent ground water sampling and analysis revealed the following contaminants of concern:

- 1,1,2,2-tetrachloroethane (1,1,2,2-PCA) ranging from 17 to 300 ppb;
- Trans-1,2-dichloroethene (DCE) ranging from 30 to 100 ppb;
- TCE ranging from 54 to 130 ppb; and
- Tetrachloroethene (PCE) ranging from 1.6 to 5.4 ppb.

The results of the RI also determined that the major source of contamination in the well was located generally northeast of Well 12A. The RI concluded that continued pumping of Well 12A could capture the contaminant plume even if other production wells were pumping. This meant that Well 12A could provide a hydraulic barrier to the spread of contamination and protect the rest of the well field. If Well 12A was not pumped to provide a hydraulic barrier, it was hypothesized that other operating wells could be impacted by the contaminant plume, rendering them unsuitable for drinking water use (EPA 2008a).

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Focused Feasibility Study:

In January 1983, the EPA conducted a Focused Feasibility Study (FFS) to determine the most cost-effective treatment for Well 12A that would protect the drinking water supply for the City of Tacoma. The study included an Endangerment Assessment that evaluated the risks to the general population if no action was taken. The FFS recommended that a pump-and-treat system with air stripping be implemented on an interim basis. Carbon adsorption was also considered but was more expensive and so was eliminated from further evaluation (EPA 2008a).

Record of Decision:

On March 18, 1983, the EPA signed a Record of Decision (ROD) for an Initial Remedial Measure. The ROD called for the design and construction of five air stripping towers at Well 12A operating in parallel to treat up to 3,500 gallons per minute (gpm) of contaminated ground water. The ROD required treatment to be sufficiently protective of consumption of aquatic life if groundwater from this area was discharged either to Commencement Bay or to the city's sanitary sewer system. Construction of the treatment system was authorized in March 1983, and the system began operating in July 1983. The system was operated by the City of Tacoma until early November, when production from the well field for peak demand was no longer needed. Since this time, operation of the treatment system has continued on a seasonal basis (during peak demand) to reduce impacts on the remaining well field and is planned to continue operation until remediation is complete (EPA 2008a).

Phase II Remedial Investigation/Feasibility Study:

Because the Phase I RI identified only a general source location, the EPA authorized a study of historical solvent use and disposal practices in the suspect area in December 1982. This work included a document review and interviews with owners of businesses in the vicinity of Well 12A. The interviews focused on businesses that might have used PCA. PCA was targeted because few businesses near the well used PCA, thus reducing the number of potential sources of contamination. In May 1983, the EPA authorized a supplement RI/Feasibility Study (FS) to further define the extent of ground water contamination and to attempt to locate the source. One of the properties identified during this work was the Time Oil Company. This company's property had been used in the past for various industries, including oil recycling and paint and lacquer manufacturing. Oil recycling and solvent processing began in the early 1920s and continued until 1991, with occasional interruptions due to changes in ownership and a large fire in 1976. Four monitoring wells were installed on the Time Oil Company property and sampled. Ground water located near the Time Oil Company property was found to contain concentrations of TCE, PCA, and DCE in the low parts per million (ppm) range, which was substantially higher than the detections in other wells and orders of magnitude higher than concentrations in Well 12A. It was determined that these monitoring wells were at or near the source of contamination. Subsequently, the EPA collected air and surface soil samples north of the Time Oil Property on a BNSF rail spur. The air sampling



results indicated low levels of contaminants; however, the soil samples contained "significant" concentrations of TCE and PCA, which confirmed that the property was the source of contamination (EPA 2008a).

Time Oil ceased operations at the facility in 1991. Currently, the facility is used to store heating, ventilation, and air conditioning equipment (EPA 2008a).

2.4.2 Commencement Bay - Nearshore/Tideflats

The Commencement Bay Nearshore/Tideflats site covers 12 square miles and includes more than 300 active businesses and approximately 500 identified point and non-point sources of contamination. This site is also divided into the following project areas for management:

- Asarco Tacoma Smelter,
- Ruston/North Tacoma Study Area,
- Tacoma Tar Pits, and
- Tideflats areas.

Of these project areas, the tideflats areas are further divided into the following sub-areas:

- St. Paul Waterway,
- Sitcum Waterway,
- Hylebos Waterway,
- Middle Waterway,
- Olympic View Resource Area,
- Thea Foss and Wheeler-Osgood Waterways,
- Puyallup Land Settlement, and
- Source Control.

Of these waterways, the Thea Foss Waterway is nearest to the Tacoma Seep site. The Thea Foss waterway is directly connected to the Tacoma Seep site, as the water from the seep is directed the City of Tacoma's storm water system which discharges via outfalls located in the waterway. There are eleven primary outfalls which discharge into the Thea Foss Waterway (Tacoma 2010). Water emanating from the seep pipe enters an older portion the City of Tacoma's storm water drainage system, which discharges into the head of the Thea Foss Waterway via outfall number 237B (Figure 1-1; Oberlander 2011). The Thea Foss Waterway is is discussed here because of its proximity and connection to the Tacoma Seep site and because of the nature of the cleanup.

The Thea Foss Waterway is the westernmost waterway in Commencement Bay and is oriented north-south. The land adjacent to the waterway was primarily industrial from the 1890s to the 1980s. Contaminants associated with the waterway include metals, SVOCs, and PCBs. Cleanup activities associated with the waterway have included source-control actions and dredging sediments in the waterway (EPA 2004a).

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2.5 Previous Investigations

As previously stated, the seep was discovered and sampled by Ecology in 2005. A number of ground water seeps are present in the Tacoma area. Previous sampling of these seeps by Ecology indicated the presence of ground water contamination. Ecology sampled the South Tacoma Way seep in 2005 to determine if the ground water quality was similar to other seeps in the area. During that sampling event, water was collected from the seep and analyzed for VOCs. The initial sample results indicated the presence of VOCs, including TCE at a concentration that exceeded the MCL. The seep was sampled a second time by in June 2008, though it is unclear who preformed this sampling. These sample results also indicated the presence of TCE at a concentration that exceeded the MCL (Colman 2011).

2.5.1 Preliminary Assessment

In April 2010, E & E completed a Preliminary Assessment (PA) of the Tacoma Seep site for the EPA, which focused on identifying businesses upslope of the seep that may use VOCs in daily operations. The intent of the PA was to determine potential sources of contamination to the Tacoma Seep site (E & E 2010b). This PA was a desktop review of existing site-related information; it did not include a site visit.

2.6 Summary of SI Investigation Locations

Sampling under the SI was conducted at the Tacoma Seep site, a seep that is known to contain Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)—regulated substances. The features identified for inspection under the South Tacoma SI were determined based on a review of background information. These features are discussed in the following sections

2.6.1 Potential Sources

Prior to the field sampling event, it was thought that potential sources of contamination to the seep were upslope to the north of the seep. Based on the location of the seep pipe, discovered during the field event, it seems unlikely that they can still be considered sources. For this reason, the source of contamination to the Tacoma Seep site is unknown. Based on the eastwardly direction of ground water flow (EPA 2009), an alternate source maybe the source of contamination to the Well 12A OU.

2.6.2 Targets

This SI was designed to assist in determining whether, and to what degree, contaminants are impacting the ground water seeps along and near South Tacoma Way. The potential primary contaminants of concerns in this case are VOCs. However, this SI also included analysis for SVOCs, pesticides/PCBs, Total Petroleum Hydrocarbons as gasoline (TPH-g) and diesel (TPH-d), and Target Analyte List (TAL) metals to determine whether additional contaminants are present in the ground water seep.

Field Activities and Analytical Protocol

A sampling and quality assurance plan (SQAP) for the South Tacoma SI was developed by the START prior to field sampling (E & E 2010c). This SQAP describes the sampling strategy, sampling methodology, and analytical program used to investigate the Tacoma Seep site. With few exceptions, the SI field activities were conducted in accordance with the approved SQAP. Deviations from the SQAP are described, when applicable, in this section and in the sampling location discussions in Section 6 (source areas) and Section 7 (target areas). All deviations to this SQAP were pre-approved by the EPA Task Monitor (TM) during the field sampling event and are documented in sampling plan alteration forms (SPAFs) located in Appendix A.

The SI field sampling event was conducted on September 1, 2010. The EPA TM and START project manager (PM) met with the City of Tacoma's Storm Water Source Control Supervisor, whom they followed to the seep site. Three water samples and one QA (trip blank) sample were collected as part of the SI. Sample types and methods of collection are described below. A list of all samples collected for laboratory analysis under this SI is presented in Table 3-1. Photographic documentation of SI field activities is included as Appendix B.

Alphanumeric identification numbers applied by the START to each sample location (e.g., SP01) are used in the report as the sample location identifiers. Sample locations are provided in Figure 3-1.

This section describes the sampling methodology, analytical protocol, global positioning system, and investigation-derived waste that were used in the field sampling event.

3.1 Sampling Methodology

Following collection, samples were stored on ice in coolers continuously maintained under the custody of START personnel. Chain-of-custody forms are provided in Appendix C. .

3.1.1 Seep Water Sampling

Three seep water samples were collected from continuously flowing ground water seeps. Samples were collected directly into pre-labeled and, as required, pre-preserved sample containers. All samples were analyzed for pesticides/PCBs, SVOCs, TAL metals, TPH-D, TPH-G, and VOCs.

Prior to field sampling, it was believed that more than one ground water seep was located on the north side of the former rail line directly down slope of the following addresses: 1002, 1016, and 1022 South 30th Street (Figure 3-1). When EPA and START personnel arrived at the seep, they discovered that only one seep was present and it emerged from a pipe located on the south side of the former rail line. After discussion with the EPA TM, it was decided that the START would collect a sample from this seep pipe. This change to the sampling plan is outlined in the SPAF presented in Appendix A.

Further, during a conversation with the City of Tacoma's Public Works Storm Water Source Control Supervisor, it was learned that other ground water seeps were located near the Tacoma Seep site, in Gallagher's Gulch and at the location of an opening to a former rail tunnel at one of the City of Tacoma's road maintenance yards at 25th and Hood Street (Figure 3-1). These other seeps are located approximately 0.25 and 0.65 miles downgradient (northeast) of the site, respectively. After discussion with the EPA TM, it was decided that START would collect samples from each of these seeps. This change to the original sampling plan is outlined in SPAF presented in Appendix A.

3.2 Analytical Protocol

The following samples were submitted to the Manchester Environmental Laboratory (MEL) and Contract Laboratory Program (CLP) laboratories for analysis:

- **Pesticides/PCBs:** [EPA CLP Statement of Work (SOW) SOM01.2] three samples were submitted to A4 Scientific of The Woodlands, Texas;
- **SVOCs:** (EPA CLP SOW SOM01.2) three samples were submitted to A4 Scientific of The Woodlands, Texas;
- **TAL-Metals:** (ICP-MS and CVAA) three samples were submitted to A4 Scientific of The Woodlands, Texas;
- **TPH-D:** (NWTPH-Dx) three samples were submitted to MEL of Manchester, Washington;
- **TPH-G:** (NWTPH-Gx) four samples, including QA/QC samples, were submitted to MEL of Manchester, Washington; and
- **VOCs:** (EPA Method 8260) four samples, including QA/QC samples, were submitted to A4 Scientific of The Woodlands, Texas.

3.3 Global Positioning System

A Trimble Pathfinder Processional Global Positioning System (GPS) survey unit was used by the START to approximate the sample location coordinates of the SI samples. Recorded GPS coordinates by sample point are listed in Appendix D.

3.4 Investigation-Derived Waste

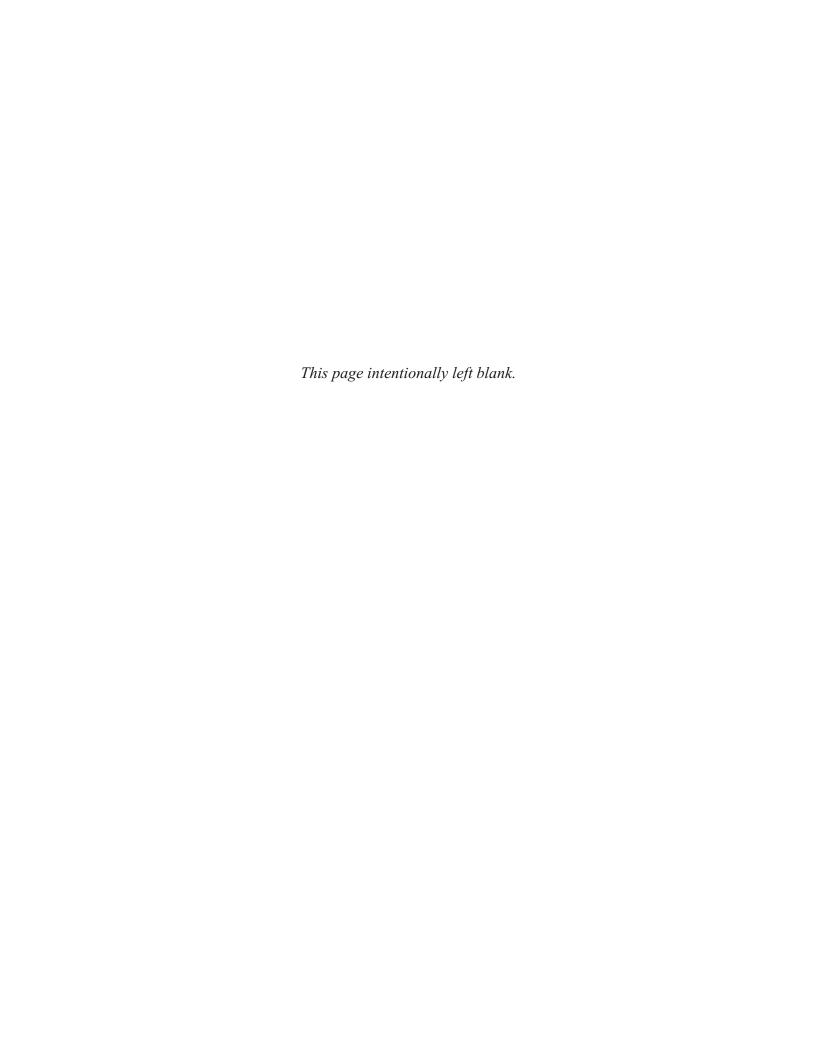
Investigation-derived waste (IDW) generated during the South Tacoma SI sampling effort included disposable personal protective equipment and dedicated sampling equipment. All disposable personal protective equipment and dedicated sampling equipment generated during field activities was rendered unusable by



3. Field Activities and Analytical Protocol

tearing (as appropriate), bagged in plastic garbage bags, and disposed of at the local municipal landfill at the end of the sampling event. No IDW remains at the site.

3-3



Quality Assurance/ Quality Control

QA/QC data are necessary to determine precision and accuracy and to demonstrate the absence of interferences and/or contamination of sampling equipment, glassware, and reagents. Specific QC requirements for laboratory analyses are incorporated in the *Contract Laboratory Program Statement of Work for Organic Analyses* (EPA 2007a) and *Contract Laboratory Program Statement of Work for Inorganic Analyses* (EPA 2007b). These QC requirements or equivalent requirements found in the analytical methods were followed for analytical work on the project. This section describes the QA/QC measures taken for the project and evaluates the usability of data presented in this report.

Data qualifiers were applied as necessary according to the following guidance:

- EPA (2004b) Contract Laboratory Program National Functional Guidelines for Inorganic Data Review; and
- EPA (2008b) USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review.

In the absence of other QC guidance, method- and/or SOP-specific QC limits were also utilized to apply qualifiers to the data.

4.1 Satisfaction of Data Quality Objectives

The following EPA (EPA 2000) guidance document was used to establish data quality objectives (DQOs) for this project:

• *Guidance for the Data Quality Objectives Process* (EPA QA/G-4), EPA/600/R-96/055.

The EPA TM determined that definitive data without error and bias determination would be used for the sampling and analyses conducted during the field activities. The data quality achieved during the field work produced sufficient data that met the DQOs stated in the SQAP (E & E 2010a). A detailed discussion of accomplished project objectives is presented in the following sections.

4.2 QA/QC Samples

Rinsate blank QA samples were not collected. Rinsate blank samples were not required because all samples were collected using dedicated sampling equipment. One trip blank sample was collected per sample cooler of VOC samples (i.e., VOCs and TPH-G analysis). QC samples included matrix spike/matrix spike duplicate (MS/MSD) and/or blank spike (BS) samples for organic analyses at a



rate of one MS/MSD and/or BS per 20 samples per matrix and MS/MSD samples for inorganic analyses at a rate of one MS/Duplicate per 20 samples per matrix.

4.3 Project-Specific Data Quality Objectives

The laboratory data were reviewed to ensure that DQOs for the project were met. The following sections describe the laboratories' abilities to meet project DQOs for precision, accuracy, and completeness and the field team's ability to meet project DQOs for representativeness and comparability. The laboratories and the field team were able to meet DQOs for the project.

4.3.1 Precision

Precision measures the reproducibility of the sampling and analytical methodology. Laboratory and field precision is defined as the relative percent difference (RPD) between duplicate sample analyses. The laboratory duplicate samples or MS/MSD samples measure the precision of the analytical method. The RPD values were reviewed for all commercial laboratory samples. All duplicate results were within QC limits.

4.3.2 Accuracy

Accuracy indicates the conformity of the measurements to fact. Laboratory accuracy is defined as the surrogate spike percent recovery (%R) or the MS/MSD/BS %R values for all laboratory analyses. The surrogate %R values were reviewed for all appropriate sample analyses. All surrogate results were within QC limits.

The spike %R values were reviewed for all MS/MSD/BS analyses. A total of four sample results (approximately 0.7% of the data) were qualified as estimated quantities (J or UJ) based on spike QC outliers.

4.3.3 Completeness

Data completeness is defined as the percentage of usable data (usable data divided by the total possible data). All laboratory data were reviewed for data validation and usability. A total of four sample results (approximately 0.7% of the data) were rejected; therefore, the project DQO for completeness of 90% was met.

4.3.4 Representativeness

Data representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point or environmental condition. The number and selection of samples were determined in the field to account accurately for site variations and sample matrices. The DQO for representativeness was met.

4.3.5 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data produced for this site followed applicable field sampling techniques and specific analytical methodology. The DQO for comparability was met.



4.4 Laboratory QA/QC Parameters

Holding times, temperatures, sample containers condition, laboratory blank samples, trip blank samples, serial dilution analyses, and interference check sample analyses were reviewed. These QA/QC parameters are summarized below. In general, the laboratory and field QA/QC parameters were considered acceptable.

4.4.1 Holding Times/Temperatures/Sample Containers

All holding times, sample temperatures, and containers were acceptable.

4.4.2 Laboratory Blanks

All laboratory blanks met the frequency criteria. The following potential contaminants of concern were detected in the laboratory blanks:

• TAL metals: iron and mercury

VOCs: methylene chloride

See the data validation memoranda for results qualified based on blank contamination.

4.4.3 Trip Blank

The trip blank met the frequency criteria. The following potential contaminant of concern was detected in the trip blank:

• VOCs: acetone

All acetone sample results were less than five times the acetone trip blank concentration and were qualified as not detected (U).

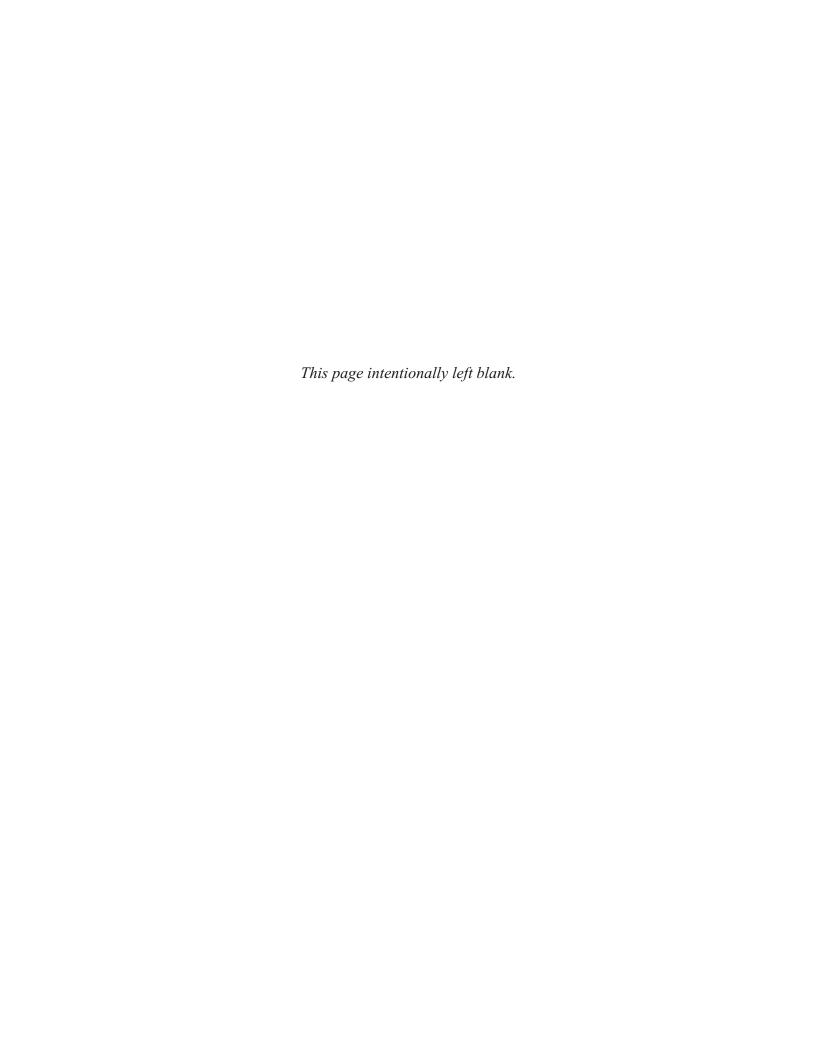
4.4.4 Serial Dilution

Serial dilution analyses were performed at a frequency of one per 20 samples per matrix, meeting QC frequency criteria. All serial dilution results were within QC limits.

4.4.5 Interference Check Samples

Interference check sample analyses were performed at a frequency of one per 20 samples per matrix, meeting QC frequency criteria. All interference check sample results were within QC limits.

4-3



Analytical Results Reporting and Background Samples

This section describes the reporting and methods applied to the analytical results presented in this report. Table 3-1 lists all samples collected for laboratory analysis. No suitable background seep location could be found near the site; therefore, no background sample was collected.

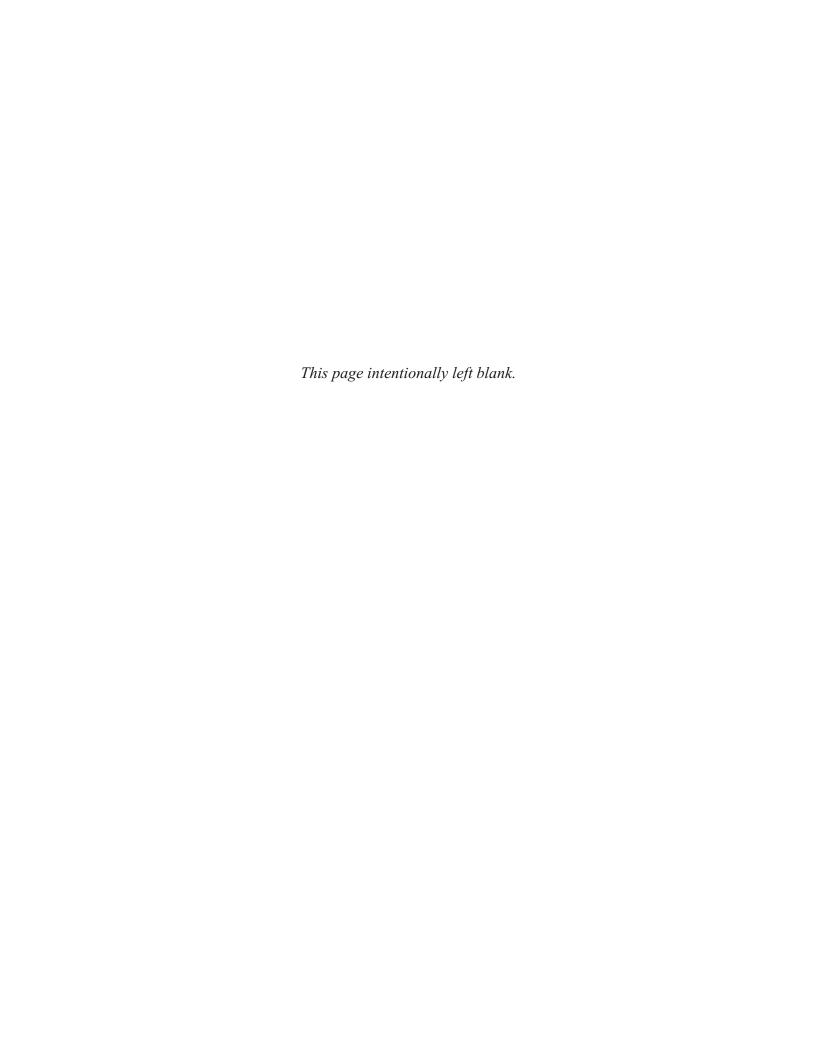
5.1 Analytical Results Evaluation Criteria

Analytical results presented in the summary tables located in Section 7 show all analytes detected above laboratory detection limits in bold type. Analytical results indicating elevated concentrations of contaminants in target samples (Section 7) are shown underlined and in bold type. For the purposes of this investigation, elevated concentrations are those that are:

- Equal to or greater than the sample's Contract Required Quantitation Limit (CRQL), or the Sample Quantitation Limit when a non-CLP laboratory was used; and
- Equal to or greater than the instrument detection limit for organic analyses.

Because metals are naturally occurring and a background seep sample was not collected, these analytes were not evaluated as part of this investigation.

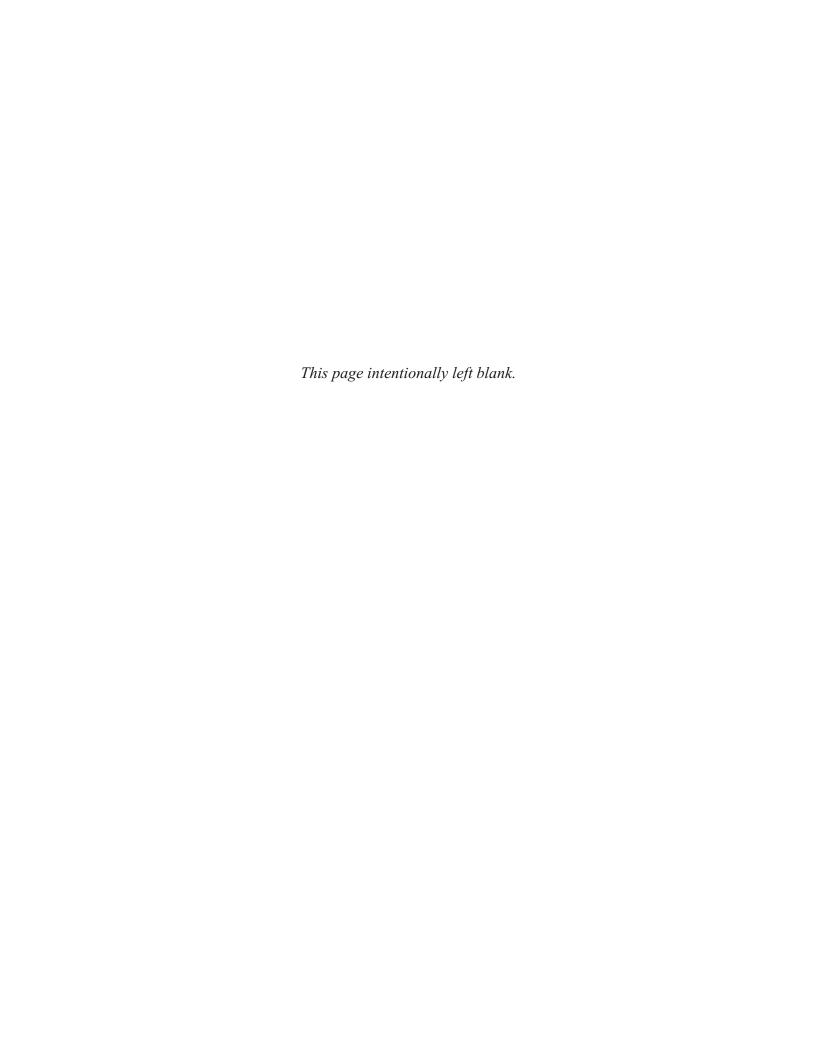
The analytical summary tables present all detected compounds, but only detected analytes that met the elevated concentration criteria are discussed in the text of this report.



Potential Sources

As noted in previous sections, the source of contamination to the seep at the Tacoma Seep site is unknown. One potential source is the former Time Oil Company, which is the source of contamination to the Well 12A OU (as discussed above in Section 2.4.1). The Time Oil Company was located approximately 1 mile west (up gradient) of the seep pipe location along South Tacoma Way (Figure 2-3).

The supplement RI/FS conducted in May 1983 further defined the extent of this ground water contamination. The Time Oil Company was determined to be the source of contamination (EPA 2008a). Four monitoring wells installed on the Time Oil Company property indicated that concentrations of TCE, PCA, and DCE were present in the low ppm range, which was substantially higher than the detections in other wells and orders of magnitude higher than concentrations in Well 12A. Subsequently, the EPA collected air and surface soil samples north of the Time Oil Property on a BNSF rail spur. The air sampling results indicated low levels of contaminant; however, the soil samples contained "significant" concentrations of TCE and PCA.



Migration/Exposure Pathways and Targets

The following subsections describe migration pathways and potential targets within the site's range of influence (Figure 7-1). This section discusses only the ground water migration pathway and associated targets. It does not address the surface water migration pathway, soil exposure pathway, or air migration pathway because the only contamination associated with this site occurs in ground water.

7.1 Ground Water Migration Pathway

The TDL for the ground water migration pathway is a 4-mile radius that extends from the sources at the site. Figure 7-1 depicts the ground water 4-TDL.

7.1.1 Geologic Setting

Consolidated and unconsolidated rock characterizes the geology in the general area of the site, with several types of formations that have very different characteristics and origins. The consolidated rocks are, for the most part, the oldest in the area (ranging from Eocene to Miocene in age) and constitute the bedrock upon which the younger, unconsolidated rocks were deposited (Walters and Kimmel 1968).

One formation that likely underlies the site is the Salmon Springs drift. This is a third glaciation that has been discovered in the area. The drift consists primarily of stratified sand and gravel containing thin, discontinuous beds of silt and clay. Lenses of till are present, but no extensive single till sheet has been found. The unit is derived principally from the central Cascades, but sediments of northern derivation are common, and sediments of Mount Rainier provenance are abundant locally in some horizons. The unit is commonly oxidized to a yellowish- or reddish-brown in the zone of aerations. Where oxidized in the zone of saturation, the unit is compact, and springs occur as a result of the low permeability of the compacted materials (Walters and Kimmel 1968).

Another formation that is likely to underlie the site is the Kitsap Formation, which is composed of beds of fluvial and marsh deposits derived principally from older Pleistocene age deposits and from Mount Rainier sources. In most of the area, the formation consists of three parts: unoxidized sand and gravel at the base, fine-grained material in the middle, and oxidized sand and gravel at the top. The formation unconformably overlies drifts of probable Salmon Spring age. The basal gravel is brownish-black and of unknown thickness. Overlying this deposit

7. Migration/Exposure Pathways and Targets

are beds of clay, silt, and fine sand that contain discontinuous peat layers near the top. The color of most of the clay and silt deposits is yellowish-brown or yellowish-orange; some silty, sandy clay is a grayish-blue-green. The Kitsap Formation was deposited in a non-glacial climate during an interval between glaciations. Evidence of both alluvial and lacustrine environments is present in most exposures of the formation. The presence of sediments derived from Mount Rainier indicates that the Puget Sound Lowland was free of ice, thus permitting northward drainage toward the Strait of Juan de Fuca during accumulation of the materials that compose the formation. The following is a typical horizon of this formation with thickness in feet (Walters and Kimmel 1968).

Material	Thickness (feet)
Gravel - cobble, yellowish-brown, compact; Mount Rainer central Cascade and northern Cascade provenance	7
Clay - silty yellowish-brown, with thin, fine, sand beds	1.5
Peat	0.2
Clay - organic-rich and black at top, grades downward into dark yellowish-orange	1.5
Sand - pale yellowish-brown; mainly of Mount Rainier provenance	1.2
Gravel and sand - dark yellowish-orange, compact; contains rocks of Mount Rainier, central Cascades, and northern Cascades provenance. Sand mainly of Mount Rainier provenance	24
Covered	6
Probable Erosional Unconformity	
Clay - dark yellowish-orange, contains thin sand beds	2
Sand - pale yellowish-brown and moderate yellowish-brown	4.5
Clay - pale yellowish-brown to grayish-orange	1.0
Sand - fine, pale yellowish-brown	0.8
Clay - dark yellowish-orange, massive	2.4
Gravel - pebble to cobble, containing sand lenses near the top, generally unoxidized and brownish-gray, Mount Rainier, central Cascades, and northern Cascades provenance, many reworked stained pebbles	20+
Exposed thickness of Kitsap Formation	74 +

7.1.2 Aquifer System

The Central Pierce County aquifer system consists primarily of unconsolidated sediment deposited by glaciers and associated meltwater during the Quaternary Period. The ground water moves regionally toward Puget Sound and the river valleys that constitute the aquifer system boundaries. Locally, the direction and gradient of ground water movement can vary dramatically from the overall regional trend (EPA 1998).

7. Migration/Exposure Pathways and Targets

Depth to ground water varies from zero to hundreds of feet. Deep wells drilled within the area penetrate multiple productive aquifers of permeable glacial outwash separated by relatively impermeable aquitards of glacial till or non-glacial sediments. The degree of hydrologic connection between individual aquifer units can vary greatly (EPA 1998).

The Tacoma Seep site is located in the northeastern portion of the Tacoma Upland. Ground water in this area is recharged by precipitation. Ground water flow is controlled by the geology and topography in the area and generally flows eastward through the South Tacoma Channel, an area composed of recessional outwash deposits (EPA 2009). The unconsolidated glacial drift and alluvium that underlie the area contain aquifers of high porosity and permeability and yield large amounts of water (Griffin and Sceva et al.1962).

The sand and gravel aquifers are discontinuous and occur as lenses; therefore, the amount of water available differs from place to place. The outwash sands and gravels of the Vashon glaciation comprise the best aquifers in the area. In general, these deposits do not extend more than 200 to 300 feet below the surface (Griffin and Sceva et al. 1962).

In the Tacoma Upland, outwash sands and gravel deposits and the underlying pre-Vashon (Kitsap Formation) unconsolidated deposits include the most productive aquifers. Glacial till and the older semi-consolidated sediments generally yield only small amounts of water (Griffin and Sceva et al. 1962).

Part of the Tacoma Upland is mantled by till from the Vashon glaciation in an unsorted mixture of clay, silt, sand, gravel, and boulders, which was deposited during the last glacier advance into the Tacoma area. The till is generally light gray, almost having the appearance of concrete, and does not form a productive aquifer. However, in areas where till is sufficiently thick (20 to 30 feet) it can yield a small amount of water in large-diameter wells (Griffin and Sceva et al. 1962).

The outwash deposits, consisting mostly of coarse sands and gravels, form the most productive aquifers in the Tacoma Upland. These sediments were deposited by meltwater streams during both the advance and recession of glaciers. The recessional outwash material in this area is mostly coarse gravel and ranges from a few feet to more than 200 feet thick. The advance outwash materials, which are as much as 100 feet thick, generally contain a larger proportion of sand than the recessional outwash (Griffin and Sceva et al. 1962).

For the Tacoma area as a whole, the contact between the Vashon-age deposits and the pre-Vashon unconsolidated deposits is unconformable. This contact ranges from 700 feet above sea level to as much as 300 feet below sea level (Griffin and Sceva et al. 1962).



7.1.3 Drinking Water Targets

Approximately 164,040 people use ground water for drinking water purposes within the 4-mile TDL. A combination of Group A and Group B community water systems and domestic wells are present. The Washington Administrative Code (WAC) defines the group designation for community water systems. Water system group definitions as provided by the Washington State Department of Health (DOH) are as follows:

Group A. (WAC 246-290). Group A water systems are those with 15 or more service connections, regardless of the number of people they serve, or systems serving an average of 25 or more people per day for 60 or more days within a calendar year, regardless of the number of service connections. Group A water systems do not include systems serving fewer than 15 single-family residences, regardless of the number of people.

Group B (WAC 246-291). Group B water systems serve fewer than 15 residential connections and fewer than 25 people per day, or 25 or more people per day fewer than 60 days per year. Group B water systems are those public water systems that do not meet the definition of a Group A water system.

The Washington State DOH maintains records of all active public water systems. Public water systems, regardless of group designation, indicate the total number of wells in the system, number of connections, and total population served. A search of the DOH Sentry Internet database revealed that seven Group A community well systems serve a total population of 164,040 people, and 10 Group B community wells serve a total population of 53 people (DOH 2009). All of the Type B wells are located 3 to 4 miles from the site. Wells and their associated populations are presented by distance ring in Table 7-1.

The Elmwood Mobile Manor maintains one well that serves a population of 60 residents. This well is located 2 to 3 miles from the site (DOH 2009).

The Valleybrook Village maintains one well that serves a population of 65 residents. This well is located 2 to 3 miles from the site (DOH 2009). The Tacoma Country Estates maintains one well that serves a population of 231 residents. This well is located 3 to 4 miles from the site (DOH 2009).

The Golden Valley water system maintains a well system consisting of two wells, both of which are located within the TDL. The total population served is 200 people. Neither of the wells contributes more than 40% of the total capacity; therefore, each well is assumed to serve approximately 100 people. Both wells are located between 3 and 4 miles from the site (DOH 2009).

The Fife Department of Public Works maintains a well system of five wells, all of which are emergency wells and are used in the summer months. Of these five wells, one is located within the TDL. The City of Fife has an intertie system with

7. Migration/Exposure Pathways and Targets

the City of Tacoma Water Division. The population served by the system totals 7,610 people. No well supplies more than 40% of the total capacity; therefore, each well is assumed to serve 1,522 people (7,610 people/five wells). All of these wells are located between 3 to 4 miles from the site (DOH 2009).

The City of Fircrest maintains a well system consisting of seven wells. All of the wells are located within the TDL. One of these wells is an emergency well that is maintained and used at least once per year. The population served by the system totals 6,080 people. No well supplies more than 40% of the total capacity; therefore, each well is assumed to serve 869 people (6,080 people/seven wells). Three of the wells are located between 2 to 3 miles from the site, and four of the wells are located between 3 to 4 miles from the site (DOH 2009).

The City of Tacoma maintains a system consisting of 32 sources, including 30 wells, a water intake on the Green River, and a spring. Sixteen of these wells are located within the TDL; one is permanent, 14 are seasonal, and one is an emergency well. Both the permanent and seasonal wells are maintained and used annually, generally in the summer months. None of the wells contribute more than 40% of the total capacity of the system. The system serves a total population of 311,500 people; therefore, each well serves 9,734 people (311,500 people/32 wells and intakes). Five of the wells are located within a 1- to 2-mile radius, three are located within a 2- to 3-mile radius, and eight are located within a 3- to 4-mile radius (DOH 2009).

Additionally, a total of 52 domestic drinking water wells are present within the TDL (Ecology 2009). The average number of people per household for Pierce County, Washington, is 2.60 (DOC 2001). Based on this, it is estimated that approximately 135 people use drinking water from a domestic well source. Drinking water population by distance ring is presented in Table 7-1.

Additionally, based on information provide by the TM, the ground water seep pipe has been used as a source of drinking water by indigent people. Further, during the sampling of Gallagher's Gulch, the City of Tacoma's Public Works Storm Water Source Control Supervisor noted that the area was used as a camp by the homeless. It is unclear if the water in Gallagher's Gulch was used by people living there as a drinking water source.

The site is located within a designated wellhead protection area.

7.1.4 Ground Water Seep Sample Locations

A total of three ground water seep samples (SP01GW, SP02GW, and SP03GW) were collected from naturally occurring ground water seeps as part of the SI.

Sample SP01GW was collected from the ground water seep located approximately 100 feet north of South Tacoma Way (Figure 3-1). The seep consists of an approximate 3-inch inside diameter seep pipe protruding out of hillside. Flow from the pipe was estimated at approximately 20 gallons per minute. No discern-

7. Migration/Exposure Pathways and Targets

able odors or coloration was noted at this sample location. Photos of the seep pipe are presented in Appendix B. As stated in Section 2.4.2, water emanating from the seep pipe is directed into the City of Tacoma's storm water drainage system. This water is then discharged into the Thea Foss Waterway from outfall 237B (Oberlander 2011).

Sample SP02GW was collected from the ground water seep located approximately 350 feet south of South Tacoma Way, between South Yakima Avenue and Delin Street in Gallagher's Gulch (Figure 3-1). Additionally SP02GW is located approximately 620 feet northwest of the Hood Street Reservoir. Unlike sample location SP01GW, this seep emanated directly from the ground. Flow from this seep was roughly estimated at approximately 200 gallons per minute. No discernable odors or coloration was noted at this sample location. Photos of the ground water seep are presented in Appendix B. Like the seep pipe, water from this seep enters the City of Tacoma's storm water drainage system and is discharged into the Thea Foss Waterway from outfall 237B (Oberlander 2011).

Sample location SP03GW was collected from a ground water seep emanating from a former Union Pacific Rail Road tunnel opening. The seep consists of an approximate 12-inch pipe protruding from the hill side at the City of Tacoma's road maintenance yards at 25th Street and Hood Street. The pipe is located approximately 215 feet north of the intersection of 25th Street and Hood Street. Flow from the pipe was estimated at approximately 75 gallons per minute. No discernable odors or coloration was noted at this sample location. Photos of the ground water seep are presented in Appendix B. Water from this ground water seep is also directed into the City of Tacoma's storm water system and outfalls on the Thea Foss Waterway. Water from this seep is discharged to the waterway via outfall 237A (Oberlander 2011).

7.1.5 Ground Water Seep Sample Results

Sample results are presented in Table 7-2. Analytical results for the sample collected from the seep pipe (SP01GW) indicate the presence of TCE (a VOC) at 12 μ g/L. As stated earlier, TCE is not a naturally occurring compound; thus, any detection is considered to be significant. Additionally, the detection of TCE is greater than two times the EPA Safe Drinking Water Act MCL of 5 μ g/L for drinking water (EPA 2011). No other analytes were detected above the CRQL in sample SP01GW. No analytes were detected above the CRQL in samples SP02GW and SP03GW. As previously noted, metals were not evaluated in this analysis; however, the only metals detected were common earth crust elements.

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8

Summary and Conclusions

The seep at the Tacoma Seep site is naturally occurring and is located in the 800 block of South Tacoma Way in Tacoma, Washington. The site is located approximately 1 mile southwest of the Thea Foss Waterway and north of Interstate 5, which is north of a residential area. The seep is located south of a commercial area, approximately 0.18 miles east of South M Street and north of South Tacoma Way.

The South Tacoma Way seep is used as a drinking water source by indigent people. The seep was identified during sampling in 2005 conducted Ecology.

The SI field sampling event was conducted on September 1, 2010. A total of three ground water seep samples were collected as part of the SI. All samples were analyzed for pesticides/PCBs, SVOCs, TAL metals, TPH-D, TPH-G, and VOCs

8.1 Sources

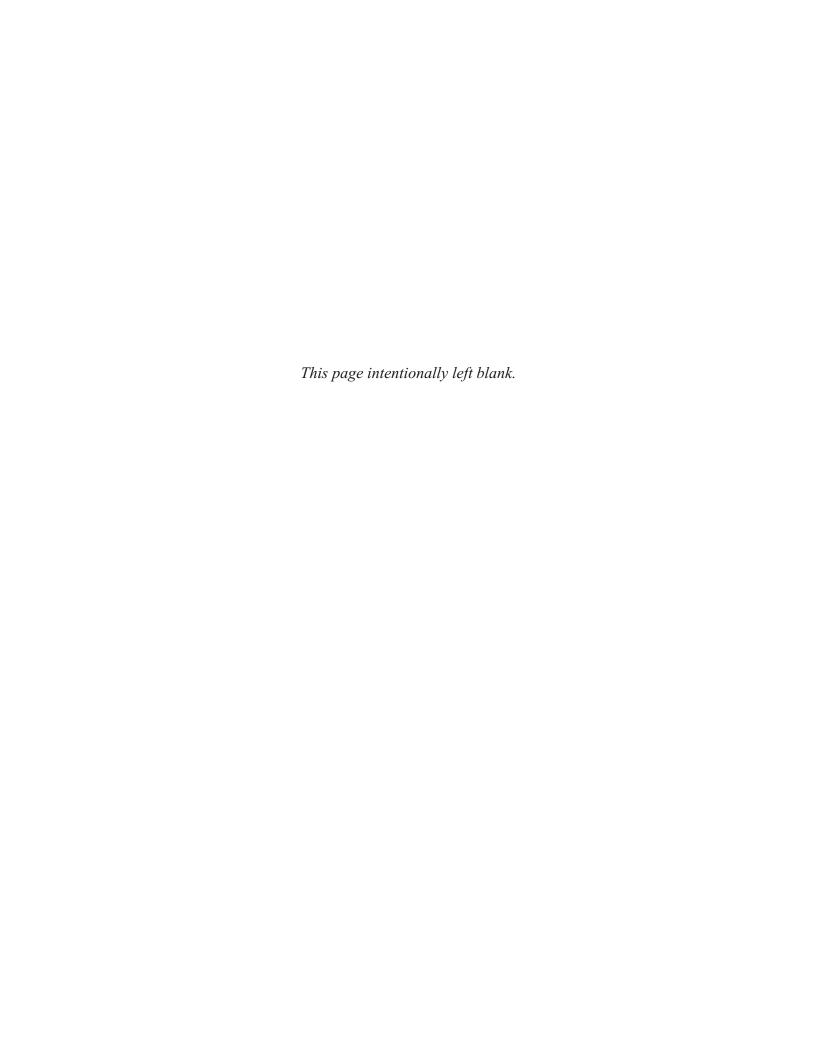
As noted in previous sections, the source of contamination to the seep is unknown. A potential source may be the former Time Oil Company, which is the source of contamination to the Well 12A OU.

8.2 Targets

Approximately 164,040 people use ground water for drinking water purposes within the 4-mile TDL. Additionally, the South Tacoma Way seep is used by indigent people as a drinking water source. Analytical results indicate the presence to TCE at significant concentrations above the EPA-established MCL at this seep.

8.3 Conclusions

Based on sample results from the SI field sampling event, the ground water emanating from the seep located near South Tacoma Way contains a CERCLA-designated hazardous substance. During the field sampling event, the potential sources thought to be potentially contaminating the ground water near the South Tacoma Way seep as identified in the PA, were determined to not be likely sources. An alternate source of potential contamination to the ground water seep may be the source of contamination to the Well 12A OU, the former Time Oil Company. Additional investigations may be required to determine the source of contamination the South Tacoma Way seep.



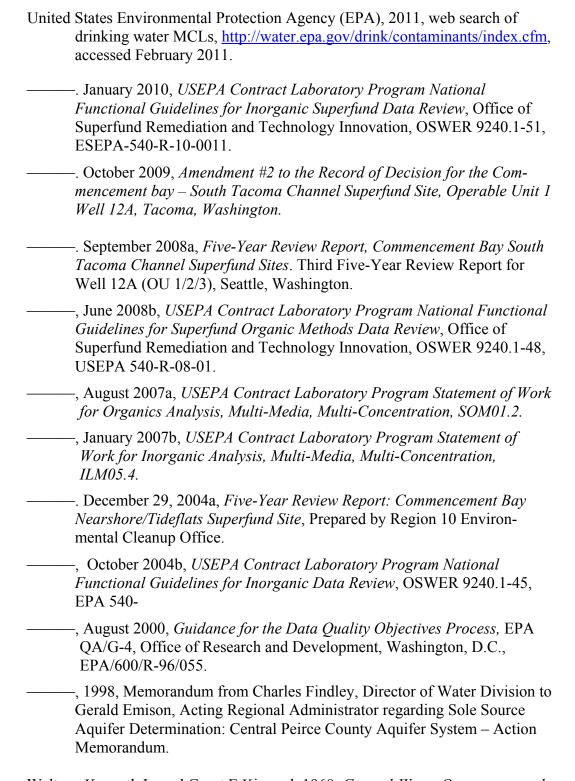
9

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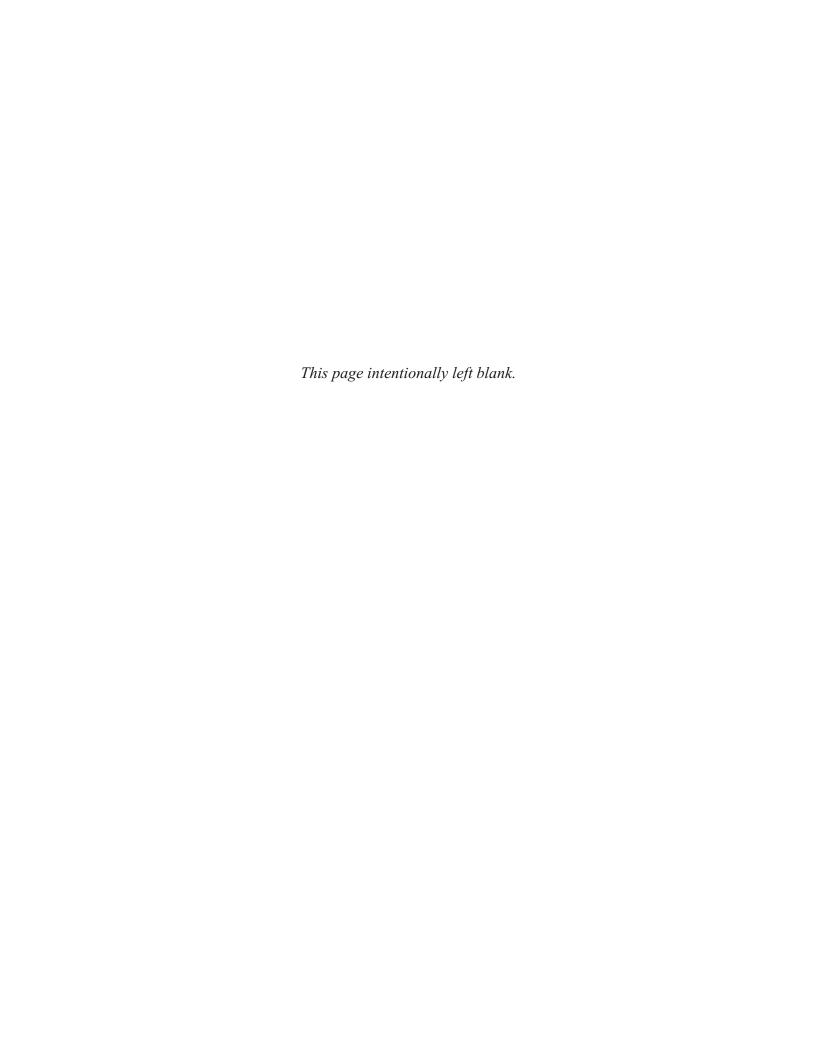


Survey Water Resources Division.

Washington State Department of Ecology (Ecology), 2009, web search of well logs for surrounding area, http://apps.ecy.wa.gov/welllog/textsearch.asp.

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Tables

Table 3-1 Sample Analysis Summary

						Sample Analysis					
EPA Sample Number	Location ID	CLP Sample ID	Sample Date	Sample Time	Tal-Metals	Pesticide/PCB s	Semivolatiles	Volatiles	TPH as Gasoline	TPH as Diesel	Sample Description
10354000	TB01WT	JD1N2	9/1/2010	14:00				X	X		Trip Blank
10354001	SP01GW	JD1N3	9/1/2010	09:40	X	X	X	X	X	X	Water clear, no odor, flowing at approximately 20 gpm, MS/MSD
10354002	SP02GW	JD1N4	9/1/2010	10:15	X	X	X	X	X	X	Water clear, no odor, flowing at approximately 200 to 400 gpm
10354003	SP03GW	JD1N5	9/1/2010	11:27	X	X	X	X	X	X	Water clear, no odor, flowing at approximately 75 gpm

Key:

CLP = Contract Laboratory Program

EPA = United States Environment Protection Agency

gpm = Gallons per minute

GW = Ground Water

ID = Identification

MS/MSD = Matrix Spike/Matrix Spike Duplicate

PCB = Polychlorinated biphenyls

TAL = Target Analyte List

TB = Trip Blank

TPH = Total Petroleum Hydrocarbons

WT = Water

Table 7-1 Drinking Water Population by Distance Ring

Distance Ring	Number of Wells	Population	Total Population for Distance Ring
0 to 1/4 mile	0	0	0
¹⁄₄ to ¹⁄₂ mile	0	0	0
½ to 1 mile	0	0	0
1 to 2 miles	City of Tacoma – 5 wells	48,670	48,675
	Domestic – 2	5	
2 to 3 miles	Elmwood – 1 well	60	31,963
	Valleybrook – 1 well	65	
	Fircrest – 3 wells	2,607	
	Tacoma – 3 wells	29,202	
	Domestic – 11	29	
3 to 4 miles	Tacoma Country Estates – 1 well	231	83,457
	Golden Valley – 2 wells	200	
	Fife – 5 wells	1,522	
	Fircrest – 4 wells	3,476	
	Tacoma – 8 wells	77,872	
	Group B wells	53	
	Domestic – 39	101	
TOTAL			164,093

Source: DOH 2009; DOC 2001; Ecology 2009.

Table 7-2 Ground Water Seep Analytical Data Summary

EPA Sample ID 1		10354001	10354001 10354002			
CLP Sample ID Station Location		JD1N3 SP01GW				
Descriptio	n	Ground Water Seep				
Volatile Organic Compounds (ug/L)						
1,4 Dioxane		R	R	R		
Trichloroethene 12		12	5 U	2.1 JQ		
Target Analyte List Metals (ug/L)						
Calcium		22200	18900	25000		
Magnesium		19200	18200	18000		
Sodium		9490	8000	11100		

Notes:

Bold type indicates the sample result is above the Contract-Required Quantitation Limit. Underline type indicates the sample result is elevated as defined in Section 5.

Key:

CLP = Contract Laboratory Program.

 $CRQL = Contract\text{-}Required\ Quantitation\ Limit.$

EPA = United States Environmental Protection Agency.

GW = Ground Water

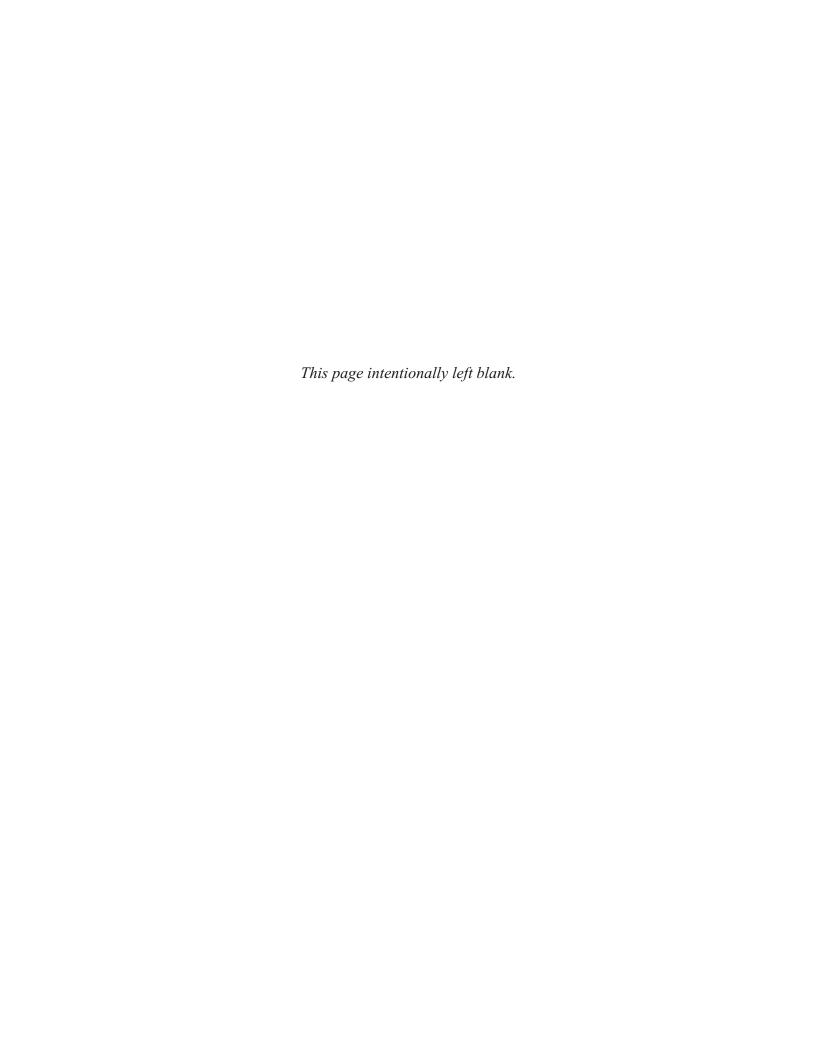
ID = Identification.

 $\mu g/L = Micrograms \ per \ kilogram.$

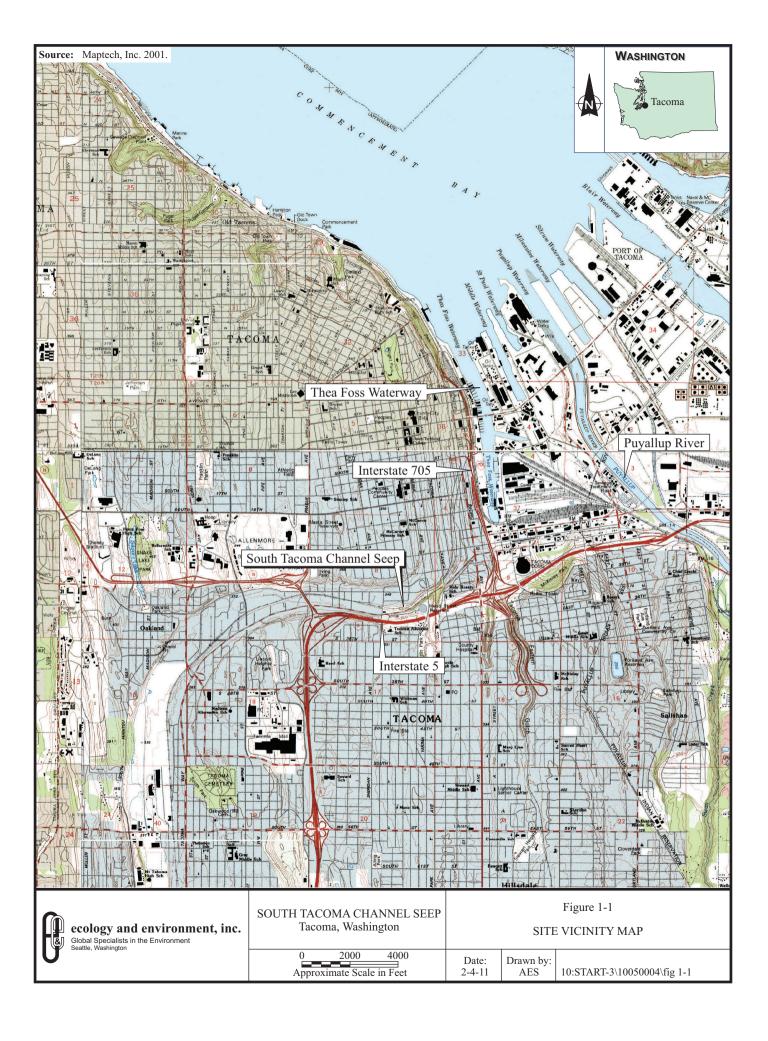
 \ensuremath{Q} = The analyte was positively identified. The associated numerical value below the CRQL.

R= The presence of this analyte can not be determined from the data due to severe quality control problems. This data are rejected and consitered unusable. No value is reported.

U = The analyte was not detected at or above the associated value.



Figures





ecology and environment, inc.

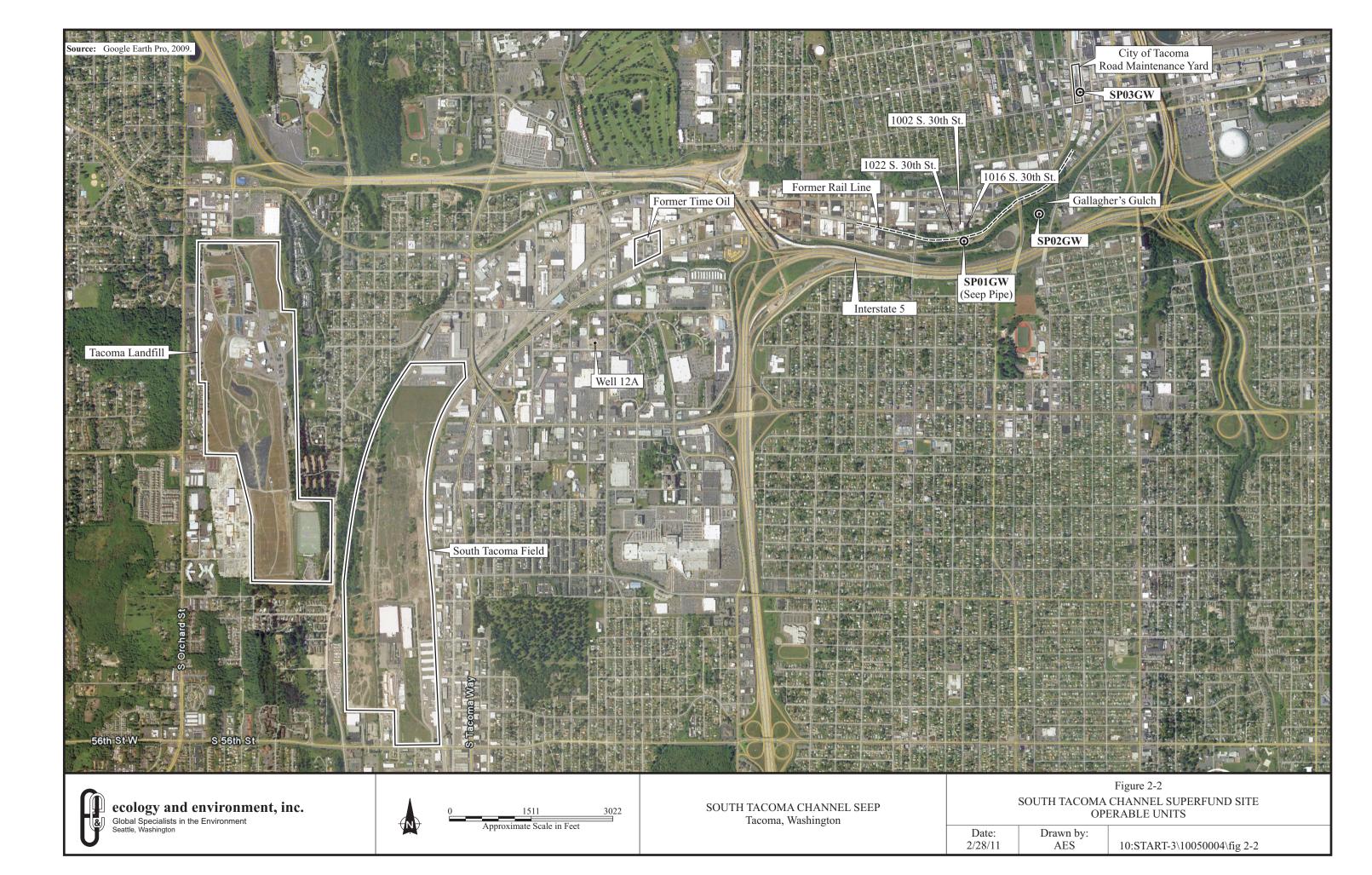
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Seattle, Washington

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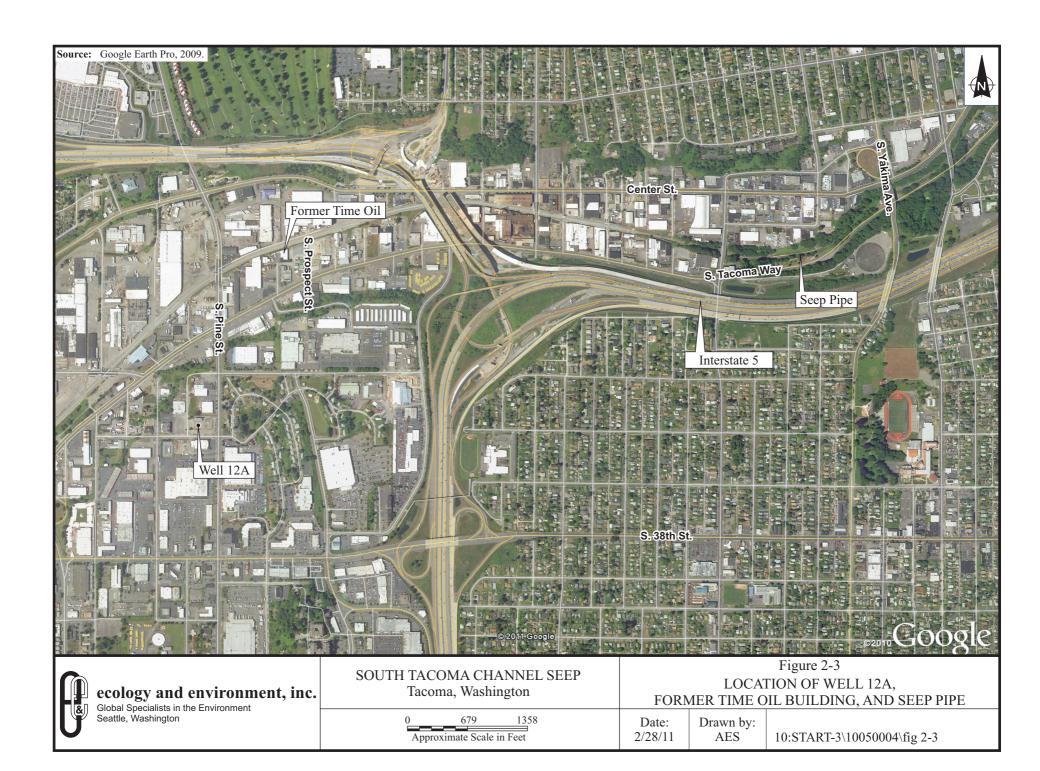
Figure 2-1
SITE MAP

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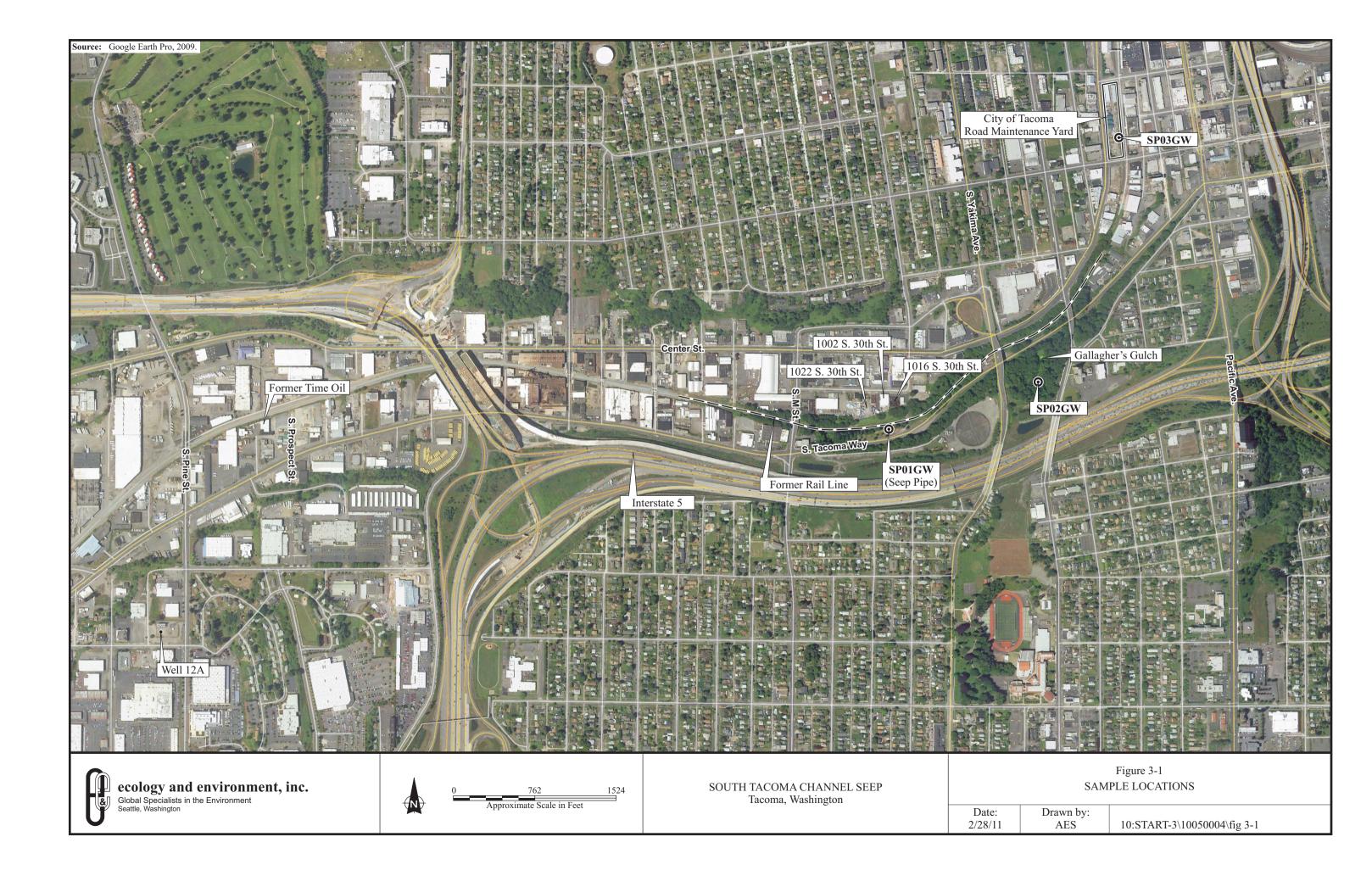
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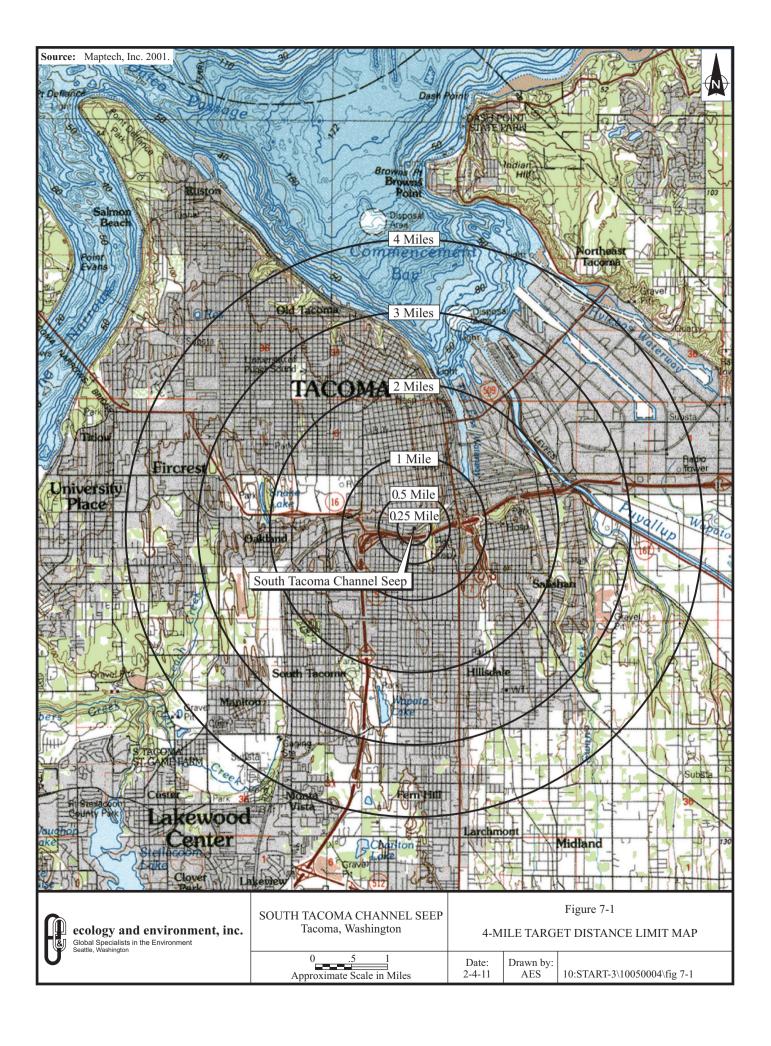


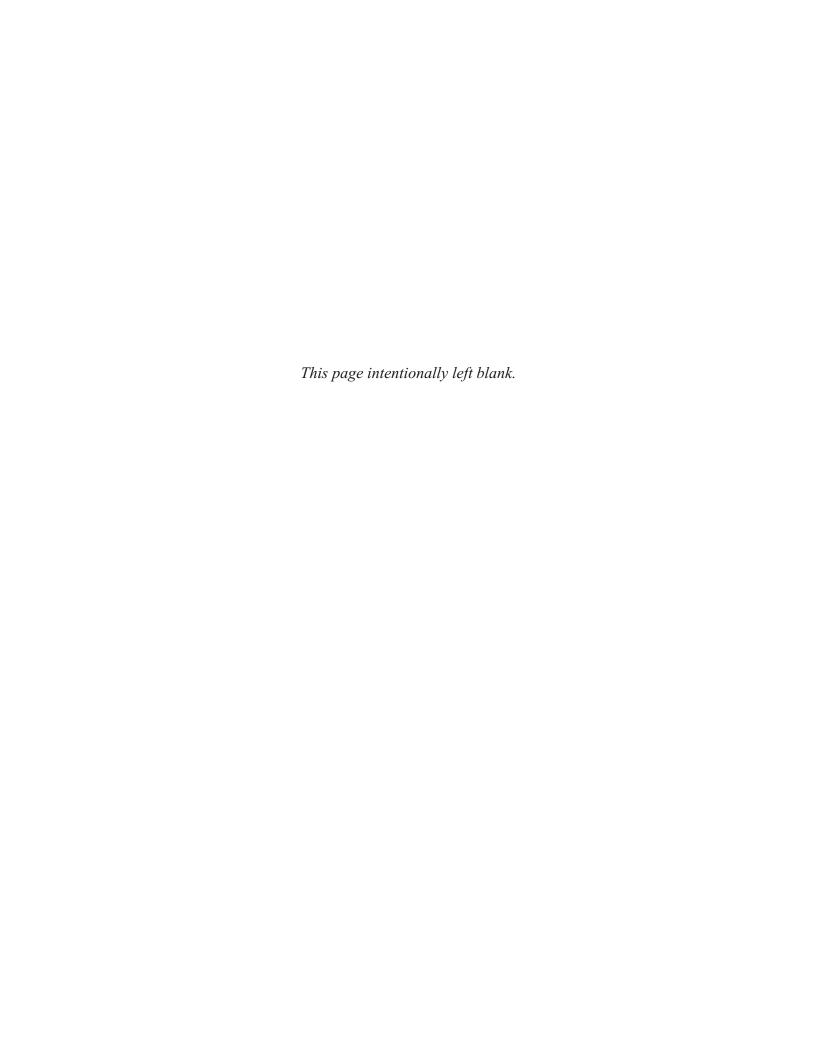














ASample Plan Alteration Forms

SAMPLE PLAN ALTERATION FORM

Project Name and Number: South Tacoma Channel Seep; TDD 10-05-0004

Material to be Sampled:

Ground water from a naturally occurring ground water seep located in the 800 block of South Tacoma Way.

Measurement Parameters:

Analyses of ground water for: Pesticides/PCBs, SVOCs, TAL Metals, TPH-D, TPH-G, and VOC.

Standard Procedure for Field Collection and Laboratory Analysis (cite references):

Up to three ground water samples were to be collected from naturally occurring ground water seeps located near South Tacoma Way and the former rail line. The samples were to be collected down gradient of properties at the following addresses: 1002, 1016, and 1022 South 30th Street. All samples were to be analyzed for Pesticides/PCBs, SVOCs, TAL Metals, TPH-D, TPH-G, and VOC.

Reason for Change in Field Procedure or Analytical Variation:

Prior to field sampling, it was believed that more than one ground water seep was located on the north side of the former rail line directly down slope of the following addresses: 1002, 1016, and 1022 South 30th Street. When EPA and START arrived at the seep, it was discovered that the seep is located on the south side of the former rail line which emerges from a pipe. No ground water seeps were located directly below the above three properties. After discussion with the EPA Task Monitor, it was decided that START would collect a sample from the seep pipe located on the south side of the former rail line.

Further, during conversation with Jim Oberlander (the City of Tacoma's Public Works Stormwater Source Control Supervisor), he indicated that other ground water seeps were located near the South Tacoma Way seep, in Galaher Gulch and at the location of an opening to a former rail tunnel at one of the City of Tacoma's road maintenance yards at 25th and Hood Street. The Galaher Gulch seep is located approximately 0.25 mile down gradient (northeast) of the South Tacoma Way seep; while the former rail tunnel seep is located approximately 0.65 mile down gradient [northeast] of the South Tacoma Way seep. After discussion with the EPA Task Monitor, it was decided that START would collect samples from each of these seeps.

Variation from Field or Analytical Procedure:

Because no ground water seep was present on the north side of the former rail line, the ground water seep sample was collected from the seep present on the south side of the former rail line. Additionally, due to the location of the groundwater seep on the south side of the former rail line, the potential sources identified in the SQAP will not be sampled

One ground water seep sample was collected from Galaher Gulch and one from a former rail tunnel. No change was made to analytical procedure.

SAMPLE PLAN ALTERATION FORM

Special Equipment, Materials, or Personnel Required:

No special equipment, materials, or personnel were required for this alteration to the sampling plan.

CONTACT	APPROVED SIGNATURE	DATE
Initiator: Jeff Fetters	Jel Fetters_	9/7/10
START PL: Linda Costello	Linda E. Catello	9/7/10
EPA TM: Brandon Perkins	Broadon Perin	9/8/2010
EPA QA Manager : Gina Grepa-Grove	Senffall	09/08/2010



B Photographic Documentation



Photo 1 Photo of water flowing from ground at Galaher Gulch.

Direction: Southwest Date: 9/2/10 Time: 10:16



Photo 3 Water flowing from ground from Galaher Gulch.

Direction: Southeast Date: 9/2/10 Time: 10:17

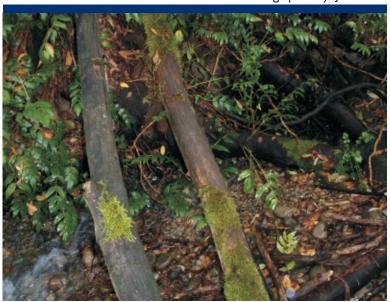


Photo 2 Water flowing from ground at Galaher Gulch.

Direction: Down Date: 9/2/10 Time: 10:17

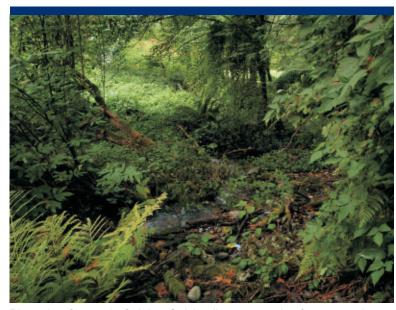


Photo 4 Stream in Galaher Gulch, all water seeping from ground.

Direction: Northeast Date: 9/2/10 Time: 10:17



Photo 5 Galaher Gulch, looking toward seep.

Direction: Southwest Date: 9/2/10 Time: 10:21

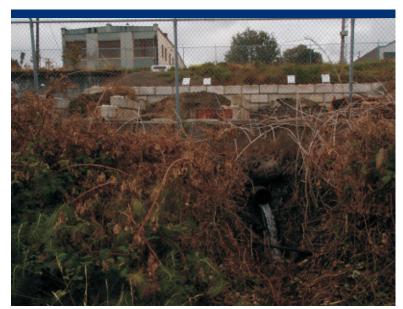


Photo 7 Water flowing from former rail tunnel at City of Tacoma truck yard.

Date: 9/2/10

Time: 11:22

Direction: West

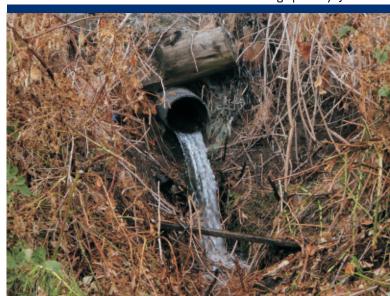


Photo 6 Water flowing from former rail tunnel at City of Tacoma truck yard.

Direction: West Date: 9/2/10 Time: 11:22



Photo 8 Seep pipe near South Tacoma Way.

Direction: South Date: 9/2/10 Time: 13:09

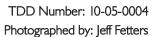




Photo 9 Close-up of seep pipe near South Tacoma Way.

Direction: South Date: 9/2/10 Time: 13:09



Photo 11 Sample SP03GW, collected from former rail tunnel.

Direction: Down Date: 9/2/10 Time: 15:40



Photo 10 Sample SP01GW, collected from seep pipe at South Tacoma Way.

Direction: Down Date: 9/2/10 Time: 15:09



Photo 12 Sample SP02GW, collected from Galaher Gulch.

Direction: Down Date: 9/2/10 Time: 15:57



C Chain-of-Custody Documentation

USEPA Contract Laboratory Program Organic Traffic Report & Chain of Custody Record

2

3

4

Chain Of Custody Record

Relinquished By

	Case No: 40457 DAS No: SDG No:	L
(Date/Time)	For Lab Use Only Lab Contract No: Unit Price: Transfer To: Lab Contract No: Unit Price:	

LABORATORY COPY

Airbill No:	865614913349
Shipped to:	A4 Scientific 1544 Sawdust Road
	Suite 505

9/2/2010

FedEx

Date Shipped:

Carrier Name:

The Woodlands TX 77380

2812925277

ORGANIC SAMPLE No.	MATRIX/ SAMPLER	TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/Bottles	SAMPLING LOCATION	SAMPLE COLLECT DATE/TIME	INORGANIC SAMPLE No	FOR LAB USE ONLY Sample Condition On Receipt
JD1N4	Ground Water/ Jeff Fetters	G	BNA (21), PEST (21)	10354002 (Ice Only) (2)	SP02GW	S: 09/01/2010 10:15		
JD1N5	Ground Water/ Jeff Fetters	G	BNA (21), PEST (21)	10354003 (Ice Only) (2)	SP03GW	S: 09/01/2010 11:27		

(Date/Time)

1/2/10 0800

Sampler Signature:

Received By

Shipment for Case Complete? N	Sample (s) to be used for laboratory QC:	Additional Sampler Signature (s):	Cooler Temperature Upon Receipt:	Chain of Custody Seal Nu	ımber :		
Analysis Key:	Concentration: L = Low, M = Medium, H = High, L/M = Low/Me	edium Type/Designate : Composite =	C, Grab = G, Both = B	Custody Seal Intact?	Shipment Iced?		
BNA = CLP TCL Semivolatiles, PEST = CLP TCL Pesticide/PCBs							

COC Number: 10-4097213-090110-0002

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

USEPA Contract Laboratory Program Organic Traffic Report & Chain of Custody Record

BNA (21), PEST (21)

	Case No: 40457 DAS No: SDG No:	
	For Lab Use Only	
	Lab Contract No:	
me)	Unit Price:	
	Transfer To:	
	Lab Contract No:	

LABORATORY COPY

Unit Price:

S: 09/01/2010 09:40

FedEx Airbill No: 865614913338 Shipped to:

Date Shipped:

Carrier Name:

JD1N3

A4 Scientific 1544 Sawdust Road

Suite 505 The Woodlands TX 77380

Ground Water/ Jeff Fetters

2812925277

9/2/2010

Chain Of Custody	Record	Sampler Signature:	
Relinquished By	(Date/Time)	Received By	(Date/Time
1110	9/2/10 0800		
2 (
3			
4	3		

ORGANIC FOR LAB USE ONLY MATRIX/ ANALYSIS/ TAG No./ **SAMPLING** SAMPLE COLLECT **INORGANIC TYPE SAMPLER** SAMPLE No. **TURNAROUND** PRESERVATIVE/Bottles LOCATION DATE/TIME SAMPLE No Sample Condition On Receipt

SP01GW

BMA-(2) PEST (6)

10354001 (Ice Only) (2)

Shipment for Case Sample (s) to be used for laboratory QC: Additional Sampler Signature (s): **Cooler Temperature Chain of Custody Seal Number:** Complete? **Upon Receipt:** JD1N3 N Composite = C, Grab = G, Both = B **Custody Seal Intact?** Shipment Iced? Concentration: L = Low, M = Medium, H = High, L/M = Low/Medium Type/Designate: Analysis Key: BNA = CLP TCL Semivolatiles, PEST = CLP TCL Pesticide/PCBs

COC Number: 10-4097213-090110-0003

USEPA Contract Laboratory Program Organic Traffic Report & Chain of Custody Record

	Case No: DAS No: SDG No:	40457	7
	For Lab Use	Only	
	Lab Contrac	t No:	
ne)	Unit Price:	_	
	Transfer To:		

Lab Contract No:

Unit Price:

Date Shipped: Carrier Name:

9/2/2010

Airbill No:

FedEx

Shipped to:

865614913327 A4 Scientific

1544 Sawdust Road

Suite 505

The Woodlands TX 77380

2812925277

Chain Of Custody	Record	Sampler Signature:	ne
Relinquished By	(Date/Time)	Received By	(Date/Time)
your o	1/2/10 6300		
2			
3			

ORGANIC SAMPLE No.	MATRIX/ SAMPLER	TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/Bottles	SAMPLING LOCATION	SAMPLE COLLECT DATE/TIME	INORGANIC SAMPLE No	FOR LAB USE ONLY Sample Condition On Receipt
JD1N2	Water/ Jeff Fetters	G	CLP TVOA (21)	10354000 (HCL) (A) 3	TB01WT	S: 09/01/2010 14:00		
JD1N3	Ground Water/ Jeff Fetters	G	BNA (21), CLP TVOA (21)	10354001 (HCL), 10354001 (Ice Only)	SP01GW	S: 09/01/2010 09:40		
JD1N4	Ground Water/ Jeff Fetters	G	CLP TVOA (21) *	10354002 (HCL) (1)	SP02GW	S: 09/01/2010 10:15		
JD1N5	Ground Water/ Jeff Fetters	G	CLP TVOA (21)	10354003 (HCL) (X) 3	SP03GW	S: 09/01/2010 11:27		

Shipment for Case Complete? N	Sample (s) to be used for laboratory QC: JD1N3	Additional Sampler Signature (s):	Cooler Temperature Upon Receipt:	Chain of Custody Seal No	umber :		
Analysis Key:	Concentration: L = Low, M = Medium, H = High, L/M = Low/Me	edium Type/Designate : Composite =	C, Grab = G, Both = B	Custody Seal Intact?	Shipment Iced?		
BNA = CLP TCL Semivolatiles, CLP TVOA = CLP TCL Trace Volatiles							

COC Number: 10-4097213-090110-0004

LABORATORY GOPY

USEPA Contract Laboratory Program Inorganic Traffic Report & Chain of Custody Record

3 4

FORMS II Lite Help Desk, CSC, 15000 Conference Center Dr., Chantilly, VA 20151-3819; Phone 703/818-4200; Fax 703/818-4602; e-Mail f2lite@fedcsc.com

Relinquished By

Chain Of Custody Record

	Case No: 40457 DAS No: SDG No:	L
	For Lab Use Only	
	Lab Contract No:	
(Date/Time)	Unit Price:	
	Transfer To:	
	Lab Contract No:	
	Unit Price:	

Date Shipped:	9/2/2010
Carrier Name:	FedEx
Airbill No:	865614913327
Shipped to:	
	A4 Scientific 1544 Sawdust Road
	Suite 505
	The Woodlands TX 77380 2812925277

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/Bottles	SAMPLING LOCATION	SAMPLE COLLECT DATE/TIME	ORGANIC SAMPLE No	FOR LAB USE ONLY Sample Condition On Receipt
MJD1N3	Ground Water/ Jeff Fetters	G	TM/Hg (21)	10354001 (HNO3) (1)	SP01GW	S: 09/01/2010 09:40		
MJD1N4	Ground Water/ Jeff Fetters	G	TM/Hg (21)	10354002 (HNO3) (1)	SP02GW	S: 09/01/2010 10:15		
MJD1N5	Ground Water/ Jeff Fetters	G	TM/Hg (21)	10354003 (HNO3) (1)	SP03GW	S: 09/01/2010 11:27		

(Date/Time)

9/2/10 0800

Sampler Signature:

Received By

Shipment for Case Complete? N	Sample (s) to be used for laboratory QC: MJD1N3	Additional Sampler Signature (s):	Cooler Temperature Upon Receipt:	Chain of Custody Seal N	lumber :
Analysis Key:	Concentration: L = Low, M = Medium, H = High, L/M = Low/Me	edium Type/Designate : Composite =	C, Grab = G, Both = B	Custody Seal Intact?	Shipment Iced?
TM/Ha = CLD TAL To	tal Matala and Maraury	A CONTRACTOR OF THE CONTRACTOR	***************************************		

COC Number: 10-4097213-090110-0004

LABORATORY COPY

USEPA Contract Laboratory Program Generic Chain of Custody

Reference Case: 40457

Client No:

R

Region:	10	Date Shipped:	9/2/2010	Chain of Custo	dy Record	Sampler Signature:	- // -
Project Code: Account Code:	TEC-985A	Carrier Name:	FedEx			Signature.	
CERCLIS ID:		Airbill:	862303106844	Relinquished By	(Date/Time)	Received By	(Date/Time)
Spill ID:		Shipped to:	Manchester Environmetal Laboratory	1/1/	9/2/10 0800		
Site Name / City/State:	South Tacoma Seep Tacoma, WA		7411 Beach Drive East Port Orchard WA 98366	2			
Project Leader:	Alen Jensen Jerr Fetters			3			
Action:	Other			4			
Sampling Co:	Ecology and Environment Inc.						-

SAMPLE No.	MATRIX/ SAMPLER	TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/Bottles	SAMPLING LOCATION	SAMPLE COLLECT DATE/TIME	QC Type
SP01GW	Ground Water/ Jeff Fetters	G	TPH-D (21), TPH-G (21)	10354001 (HCL) (96 A), MI TPH-G(9) AI, N	SP01GW	S: 09/01/2010 09:40	-
SP02GW	Ground Water/ Jeff Fetters	G	TPH-D (21), TPH-G (21)	10354002 (HCL) (2) 2 A1, N1 TPH-G (3)	SP02GW	S: 09/01/2010 10:15	
SP03GW	Ground Water/ Jeff Fetters	G	TPH-D (21), TPH-G (21)	10354003 (HCL) & Z A (M) TPH-G (3)	SP03GW	S: 09/01/2010 11:27	-
TB01WT	Water/ Jeff Fetters	G	TPH-G (21)	10354000 (HCL) (H) A) NI TPH-G (3)	TB01WT	S: 09/01/2010 14:00	

Analysis Key: Concentration: L = Low, M = Medium, H = High, L/M = Low/Medium Type/Designate: Composite = C, Grab = G, Both = B Shipment Iced?	
Analysis Key: Concentration: L = Low, M = Medium, H = High, L/M = Low/Medium Type/Designate: Composite = C, Grab = G, Both = B Shipment Iced?	
L TPH-D = TPH as Diesel, TPH-G = TPH as Gasoline	

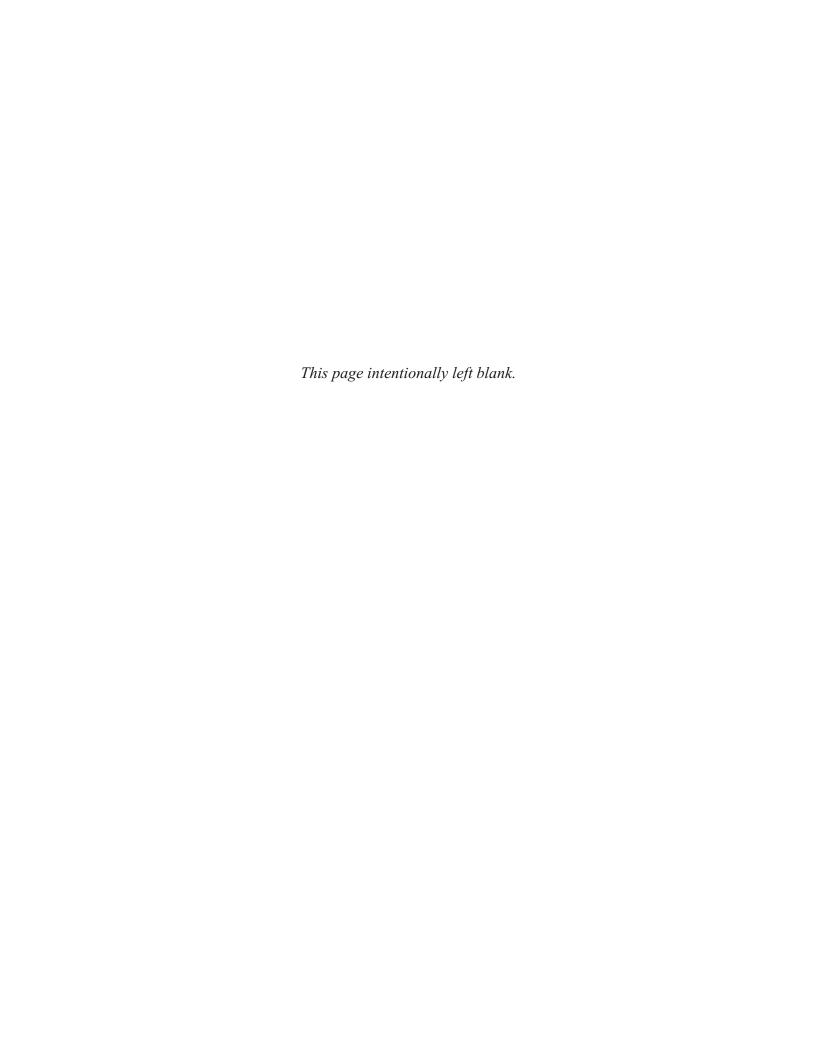
COC Number: 10-4097213-090110-0001

REGION COPY



Global Positioning System Coordinates

			GPS Cod	oridnates
	CLP Sample			
EPA Sample ID	ID	Location ID	North	West
10354001	JD1N3	SP01GW	47.231891	-122.446994
10354002	JD1N4	SP02GW	47.233035	-122.441322
10354003	JD1N5	SP03GW	47.239266	-122.438344





Data Validation Memoranda

H

ecology and environment, inc.

International Specialists in the Environment

720 Third Avenue, Suite 1700, Seattle, WA 98104 Tel: (206) 624-9537, Fax: (206) 621-9832

MEMORANDUM

DATE:

November 2, 2010

TO:

Jeff Fetters, START-3 Project Manager, E & E, Seattle, Washington

FROM:

Mark Woodke, START-3 Chemist, E & E, Seattle, Washington ! MW

SUBJ:

Data Summary Check,

South Tacoma Channel Seep Site, Tacoma, WA

REF:

TDD: 10-05-0004

PAN: 002233.0569.01SI

The data summary check of 3 water samples collected from the South Tacoma Channel Seep site located in Tacoma, Washington, has been completed. Diesel range organics (Ecology Method NWTPH-Dx) analyses were performed by the Manchester Environmental Laboratory, Port Orchard, Washington.

The samples were numbered:

10354001

10354002

10354003

No discrepancies were noted.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION 10 LABORATORY

7411 Beach Dr. East Port Orchard, Washington 98366

MEMORANDUM

SUBJECT:

Data Release for Total Petroleum Hydrocarbon - Diesel Range Extended

Analysis Results from the USEPA Region 10 Laboratory.

PROJECT NAME:

South Tacoma Channel Seep

PROJECT CODE:

TEC-985A

FROM:

Gerald Dodo, Supervisory Chemist

Office of Environmental Assessment, USEPA Region 10 Laboratory

TO:

Brandon Perkins, SAM

Office of Environmental Cleanup, USEPA Region 10

CC:

Renee Nordeen

Ecology and Environment, Inc.

I have authorized release of this data package. Attached you will find the Total Petroleum Hydrocarbon-Diesel Range Extended (TPH-Dx) results for the South Tacoma Channel Seep project samples collected 09/01/10. For further information regarding the attached data, contact me at 360-871-8728.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION 10 LABORATORY

7411 Beach Dr. East Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM FOR ORGANIC CHEMICAL ANALYSES

Date:

November 2, 2010

To:

Brandon Perkins, SAM

Office of Environmental Cleanup, USEPA Region 10

From:

Gerald Dodo, Chemist

Office of Environmental Assessment, USEPA Region 10 Laboratory

Subject:

Quality Assurance Review for the Total Petroleum Hydrocarbon - Diesel Range Extended Analysis of

Samples from the South Tacoma Channel Seep Project

Project Code: TEC-985A

Account Code: 10T10P302DD2C10ZZLA00

CC:

Renee Nordeen

Ecology and Environment, Inc.

The following is a quality assurance review of the data for total petroleum hydrocarbon - diesel range extended (TPH-Dx) analysis of water samples from the above referenced site. The preparation and analyses were performed by the EPA Region 10 Laboratory ESAT contractor using modified EPA SW846 methods 3535 and Washington State Department of Ecology Method NWTPH-Dx.

This review was conducted for the following samples:

10354001

10354002

10354003

1. Data Qualifications

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). No excursions were required from the method Standard Operating Procedure.

All measures of quality control met Laboratory/QAPP criteria.

For those tests for which the EPA Region 10 Laboratory has been accredited by the National Environmental Laboratory Accreditation Conference (NELAC), all requirements of the current NELAC Standard have been met.

2. Sample Transport and Receipt

Upon sample receipt, no conditions were noted that would impact data quality.

3. Sample Holding Times

The concentration of an analyte in a sample or extract of a sample may increase or decrease over time depending on the nature of the analyte. The holding time maximum criteria applied for the extraction of acidified water samples is 14 days from the time of collection. Extracts have a holding time maximum of 40 days from the time of preparation. All

samples were extracted and analyzed within these criteria.

4. Sample Preparation

Samples were prepared according to the method.

5. Initial Calibration/Continuing Calibration Verification (CCV)

Initial calibration was performed on 06/22/10 for #2 diesel and motor oil. Percent relative standard deviations (RSDs) of the calibration factors met the criteria of \leq 20% or the correlation coefficients met the criteria of \geq 0.99.

The CCV for effluent samples met the criteria for frequency of analysis and relative retention time (RRT) windows. The percent accuracies met the criteria of 85-115%.

6. LCS/LCSD

Data for laboratory control sample/laboratory control sample duplicates (LCS/LCSD) are generated to provide information on the accuracy and precision of the analytical method and the laboratory performance. The LCS/LCSD recoveries were within the criteria of 60-140% with a relative percent difference (RPD) of ≤ 20 .

7. Blank Analysis

Method blanks were prepared and analyzed with each sample extraction batch to evaluate the potential for laboratory contamination and effects on the sample results. Target analytes were not detected in the blanks.

8. Surrogate Spikes

Surrogate recoveries are used to help in the evaluation of laboratory performance on individual samples. The surrogate recoveries met the criteria of 50-150%.

9. Duplicate Sample Analysis

Duplicate sample analyses are performed to provide information on the precision, in the matrix of interest, of the analytical method. Duplicate analyses were performed using sample 10354001. TPH-Dx was not detected in this sample so precision could not be evaluated.

10. Matrix Spike

Matrix spike analyses are performed to provide information on the effects of sample matrices toward the analytical method. A matrix spike analysis was performed using sample 10354001 (S1). The recovery of #2 diesel met the criteria of 60-140%.

11. Compound Identification/Quantitation

The initial calibration functions were used for calculations. Reported quantitation limits were based on the initial calibration standards and sample size used for the analysis. All manual integrations have been reviewed and found to comply with acceptable integration practices. TPH-Dx was not detected in the samples.

Diesel range organics is a collective term for petroleum products that generally elute before motor oil but after gasoline from the gas chromatograph.

Motor oil range organics is a collective term for any petroleum product that chromatographically consists primarily of an unresolved envelope of compounds generally eluting after #2 diesel. Included in the definition are hydraulic fluids, motor oils, lubricating oils, cutting oils, mineral oils, transmission fluids, etc.

12. Data Qualifiers

All requirements for data qualifiers from the preceding sections were accumulated. Each sample data summary sheet and each compound was checked for positive or negative results. From this, the overall need for data qualifiers for each analysis was determined. In cases where more than one of the preceding sections required data qualifiers, the most restrictive qualifier has been added to the data.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data quality objectives. Should questions arise regarding the data, contact Gerald Dodo at the Region 10 Laboratory, phone number (360) 871-8728.

Qualifier	Definition
U	The analyte was not detected at or above the reported value.
J	The identification of the analyte is acceptable; the reported value is an estimate.
UJ	The analyte was not detected at or above the reported value. The reported value is an estimate.
R	The presence or absence of the analyte can not be determined from the data due to severe quality control problems. The data are rejected and considered unusable. No value is reported with this qualification.
NA	Not Applicable, the parameter was not analyzed for, or there is no analytical result for this parameter. No value is reported with this qualification.

9:40:00

9

Project Code:

TEC-985A

Project Name: Project Officer: SOUTH TACOMA CHANNEL SEEP

r: BRAì

BRANDON PERKINS

Account Code:

10T10P302DD2C10ZZLA00

Station Description:

SP01GW

Collected: Matrix:

9/1/10

Liquid

Sample Number:

10354001

Type:

Reg sample

•

Result Units Olfr **ORG** Container ID: A10 **Parameter** : Tot Petroleum Hyd, Diesel extended Analysis Date: 9/9/2010 : NWTPH-DX Diesel range organics Method Prep Date: 9/7/2010 Solid Phase Extraction Prep Method: 3535A U TPH-GC/Diesel Range Organics 0.096 mg/L Analytes(s): *400009 U 0.19 mg/LTPH-GC/Motor Oil Range Organic s *400010 95 %Rec Pentacosane Surrogate(s: 629992

11/2/10

Manchester Environmental Laboratory Report by Parameter for Project TEC-985A

Page 2 of

Project Code:

TEC-985A

Project Name:

SOUTH TACOMA CHANNEL SEEP

Project Officer:

BRANDON PERKINS

Account Code:

10T10P302DD2C10ZZLA00

Collected:

Matrix: Sample Number: Liquid

Type:

10354001 Duplicate

Station Description:

	-	·	Result	<u>Units</u>	Olfr	
ORG	.'					
Parameter	: Tot Petroleum	Hyd, Diesel extended			Container II): All
Method	: NWTPH-DX	Diesel range organics		Ana	lysis Date: 9/9,	/2010
Prep Metho	d: 3535A	Solid Phase Extraction			Prep Date: 9/7	/2010
Analytes(s)	: *400009	TPH-GC/Diesel Range Organics	0.098	mg/L	U	
	*400010	TPH-GC/Motor Oil Range Organic s	0.20	mg/L	U	
Surrogate(s	: 629992	Pentacosane	94	%Rec		

Page 3 of

Project Code:

TEC-985A

Project Name:

SOUTH TACOMA CHANNEL SEEP

Project Officer: Account Code:

BRANDON PERKINS 10T10P302DD2C10ZZLA00

Station Description:

Collected:

Matrix:

Sample Number:

Liquid 10354001

Type:

Matrix Spike

		Result	Units	Qlfr
ORG				
Parameter : Tot Petroleum	Hyd, Diesel extended	•		Container ID: A12
Method: NWTPH-DX	Diesel range organics	÷	. Ar	nalysis Date : 9/9/2010
Prep Method: 3535A	Solid Phase Extraction			Prep Date: 9/7/2010
Surrogate(s: 629992	Pentacosane	92	%Rec	
*400009	TPH-GC/Diesel Range Organics	.82	%Rec	Sc.

Collected:

9/1/10

10:15:00

Project Code: Project Name: TEC-985A SOUTH TACOMA CHANNEL SEEP

Matrix: Sample Number:

Liquid 10354002

Project Officer:

BRANDON PERKINS

Type:

Reg sample

Account Code:

10T10P302DD2C10ZZLA00

Station Description:

SP02GW

			Result	Units	Olfr
ORG	4	•		3	
	: Tot Petroleum	Hyd, Diesel extended			Container ID: A4
Method	: NWTPH-DX	Diesel range organics		A	Analysis Date: 9/9/2010
Prep Method	: 3535A	Solid Phase Extraction		•	Prep Date: 9/7/2010
Analytes(s):	*400009	TPH-GC/Diesel Range Organics	0.10	mg/L	U
, ,	*400010	TPH-GC/Motor Oil Range Organic s	0.20	mg/L	. U
Surrogate(s :	629992	Pentacosane	93	%Rec	

5 of Page

11:27:00

9

Project Code:

TEC-985A

Project Name:

SOUTH TACOMA CHANNEL SEEP

Project Officer:

BRANDON PERKINS

Account Code:

10T10P302DD2C10ZZLA00

Station Description:

SP03GW

Collected:

9/1/10

Liquid

Matrix: Sample Number:

10354003

Type:

Reg sample

			Result	Units	Qlfr	
ORG						
Parameter	: Tot Petroleum	Hyd, Diesel extended			Container II	D: A4
Method	: NWTPH-DX	Diesel range organics	•	Ana	alysis Date: 9/9	/2010
Prep Method	: 3535A	Solid Phase Extraction		•	Prep Date: 9/7	7/2010
Analytes(s):	*400009	TPH-GC/Diesel Range Organics	0.098	mg/L	U	
<u>-</u> ,(-).	*400010	TPH-GC/Motor Oil Range Organic s	0.20	mg/L	Ų	
Surrogate(s:	629992	Pentacosane	95	%Rec		

11/2/10

Manchester Environmental Laboratory Report by Parameter for Project TEC-985A

Page 6 of

1

Project Code:

TEC-985A.

Project Name:

SOUTH TACOMA CHANNEL SEEP

Project Officer:

BRANDON PERKINS

Account Code:

10T10P302DD2C10ZZLA00

Station Description:

Collected:

onecteu:

Matrix: Sample Number: Liquid LCS0250A

Type:

LCS

<u> </u>	Result Units Olfr	
ORG		•
Parameter : Tot Petroleum Hyd, Diesel extended	Container ID	:
Method: NWTPH-DX Diesel range organics	Analysis Date: 9/9/2	2010
Prep Method: 3535A Solid Phase Extraction	Prep Date : 9/7/2	2010
Surrogate(s: 629992 Pentacosane	87 %Rec	
*400009 TPH-GC/Diesel Range Organics	76 %Rec	

Project Code:

TEC-985A

Project Name:

SOUTH TACOMA CHANNEL SEEP

TPH-GC/Diesel Range Organics

Project Officer:

BRANDON PERKINS

Account Code:

Station Description:

*400009

10T10P302DD2C10ZZLA00

Collected:

Matrix:

Liquid

Sample Number:

LCS0250B

Type:

82

LCSD

%Rec

Qlfr Units Result ORG Container ID: : Tot Petroleum Hyd, Diesel extended Parameter Analysis Date: 9/9/2010 : NWTPH-DX Diesel range organics Prep Date: 9/7/2010 Solid Phase Extraction Prep Method: 3535A 91 %Rec Surrogate(s: 629992 Pentacosane

LCS0250B LCSD

11/2/10

Manchester Environmental Laboratory Report by Parameter for Project TEC-985A

Page 8 of

Project Code:

TEC-985A

Project Name:

SOUTH TACOMA CHANNEL SEEP

Project Officer:

BRANDON PERKINS

Account Code:

10T10P302DD2C10ZZLA00

Station Description:

Collected:

Matrix:

Liquid

Sample Number:

OBW0250A1

Type:

Blank

		Result	Units	Qlfr		
ORG						
Parameter : Tot Petroleur	n Hyd, Diesel extended			Container I	DD:	
Method : NWTPH-DX	Diesel range organics		. A	Analysis Date: 9/	9/2010	
Prep Method: 3535A	Solid Phase Extraction	ı		Prep Date: 9/	7/2010	
Analytes(s): *400009	TPH-GC/Diesel Range Organics	0.10	mg/L	U		
*400010	TPH-GC/Motor Oil Range Organic s	0.20	mg/L	U		:
Surrogate(s: 629992	Pentacosane	91	%Rec			

11/2/10

Manchester Environmental Laboratory Report by Parameter for Project TEC-985A

Page 9 of

Project Code:

TEC-985A

Project Name:

SOUTH TACOMA CHANNEL SEEP

Project Officer:

BRANDON PERKINS 10T10P302DD2C10ZZLA00

Account Code: **Station Description:**

Matrix:

Collected:

Liquid

Sample Number:

OBW0250A2

Type:

Blank

	•		,		
		Result	Units	Qlfr	
ORG					
	Hyd, Diesel extended		•	Container ID:	
Method: NWTPH-DX	Diesel range organics	4.7	An	alysis Date: 9/9/2	010
Prep Method: 3535A.	Solid Phase Extraction			Prep Date : 9/7/2	010
Analytes(s): *400009	TPH-GC/Diesel Range Organics	0.10	mg/L	U	
*400010	TPH-GC/Motor Oil Range Organic s	0.20	mg/L	Ū	
Surrogate(s · 629992	Pentacosane	84	%Rec		



ecology and environment, inc.

International Specialists in the Environment

720 Third Avenue, Suite 1700, Seattle, WA 98104 Tel: (206) 624-9537, Fax: (206) 621-9832

MEMORANDUM

DATE:

November 3, 2010

TO:

Jeff Fetters, START-3 Project Manager, E & E, Seattle, Washington

FROM:

Mark Woodke, START-3 Chemist, E & E, Seattle, Washington

SUBJ:

Data Summary Check,

South Tacoma Channel Seep Site, Tacoma, WA

REF:

TDD: 10-05-0004

PAN: 002233.0569.01SI

The data summary check of 4 water samples collected from the South Tacoma Channel Seep site located in Tacoma, Washington, has been completed. Gasoline range organics (Ecology Method NWTPH-Gx) analyses were performed by the Manchester Environmental Laboratory, Port Orchard, Washington.

The samples were numbered:

10354000

10354001

10354002

10354003

No discrepancies were noted.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION 10 LABORATORY

7411 Beach Dr. East Port Orchard, Washington 98366

MEMORANDUM

SUBJECT:

Data Release for Total Petroleum Hydrocarbon - Gasoline Range Analysis

Results from the USEPA Region 10 Laboratory

PROJECT NAME:

South Tacoma Channel Seep

PROJECT CODE:

TEC-985A

FROM:

Gerald Dodo, Supervisory Chemist

Office of Environmental Assessment, USEPA Region 10 Laboratory

TO:

Brandon Perkins, SAM

Office of Environmental Cleanup, USEPA Region 10

CC:

Renee Nordeen

Ecology and Environment, Inc.

I have authorized release of this data package. Attached you will find the Total Petroleum Hydrocarbon-Gasoline Range (TPH-Gx) results for the South Tacoma Channel Seep project samples collected 09/01/10. For further information regarding the attached data, contact me at 360-871-8728.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION 10 LABORATORY

7411 Beach Dr. East Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM FOR ORGANIC CHEMICAL ANALYSES

Date:

November 2, 2010

To:

Brandon Perkins, SAM

.

Office of Environmental Cleanup, USEPA Region 10

From:

Gerald Dodo, Chemist

Office of Environmental Assessment, USEPA Region 10 Laboratory

Subject:

Quality Assurance Review for the Total Petroleum Hydrocarbon - Gasoline Range Analysis

of Samples from the South Tacoma Channel Seep Project

Project Code: TEC-985A

Account Code: 10T10P302DD2C10ZZLA00

CC:

Renee Nordeen

Ecology and Environment, Inc.

The following is a quality assurance review of the data for total petroleum hydrocarbon - gasoline range (TPH-Gx) analysis of water samples from the above referenced site. The analyses were performed by the EPA Region 10 Laboratory ESAT contractor using Washington State Department of Ecology Method NWTPH-Gx (GC/MS).

This review was conducted for the following samples:

10354000

10354001

10354002

10354003

1. Data Qualifications

Comments below refer to the quality control specifications outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). No excursions were required from the method Standard Operating Procedure.

The quality control measures which did not meet Laboratory/QAPP criteria are annotated in the title of each affected subsection with "Laboratory/QAPP Criteria Not Met".

The Region 10 Laboratory's Quality System has been accredited to the standards of the National Environmental Laboratory Accreditation Conference (NELAC).

2. Sample Transport and Receipt

Upon sample receipt, no conditions were noted that would impact data quality.

3. Sample Holding Times

The concentration of an analyte in a sample or extract of a sample may increase or decrease over time depending on the nature of the analyte. The holding time maximum criteria applied for the analysis of preserved water samples is 14 days from the time of collection. All samples were analyzed within this criterion.

4. Sample Preparation

Samples were prepared according to the method.

5. Initial Calibration/Continuing Calibration Verification (CCV)

An initial calibration was performed on 09/08/10 for TPH-Gx (unleaded gasoline composite) and the surrogate, 1,4-difluorobenzene. Percent relative standard deviations (%RSDs) of the RRFs met the criteria of ≤20%.

The CCVs met the criteria for frequency of analysis and the percent accuracies of 80-120% of the true value for TPH-Gx.

6. Blank Analysis

Method blanks were analyzed with each analytical sequence to evaluate the potential for laboratory contamination and effects on the sample results. TPH-Gx was not detected in the blanks.

7. Surrogate Spikes

Surrogate recoveries are used to help in the evaluation of laboratory performance on individual samples. All surrogate recoveries for the samples were within the criteria of 50-150%.

8. Laboratory Control Sample/Duplicate (LCS/LCSD)

Data for LCS and LCSD are generated to provide information on the accuracy and precision of the analytical method and the laboratory performance. The LCS/LCSD recoveries were within the criteria of 60-140% with a relative percent difference (RPD) of \leq 20.

9. Matrix Spike/Matrix Spike Duplicate Analysis (MS/MSD)

MS/MSD analyses are performed to provide information on the effects of sample matrices toward the analytical method. An MS/MSD analysis was performed using sample 10354001 (S1/S2). The recoveries of TPH-Gx met the criteria of 60-140% with an RPD of ≤20.

10. Compound Quantitation

The initial calibration functions were used for calculations. Reported quantitation limits were based on the initial calibration standards and sample size used for the analysis.

All manual integrations have been reviewed and found to comply with acceptable integration practices.

11. Identification

TPH-Gx range organics were not detected in any of the samples.

12. Data Qualifiers

All requirements for data qualifiers from the preceding sections were accumulated. Each sample data

summary sheet and each compound was checked for positive or negative results. From this, the overall need for data qualifiers for each analysis was determined. In cases where more than one of the preceding sections required data qualifiers, the most restrictive qualifier has been added to the data.

The usefulness of qualified data should be treated according to the severity of the qualifier in light of the project's data quality objectives. Should questions arise regarding the data, contact Gerald Dodo at the Region 10 Laboratory, phone number (360) 871 - 8728.

Qualifier	Definition
U	The analyte was not detected at or above the reported value.
J	The identification of the analyte is acceptable; the reported value is an estimate.
UJ	The analyte was not detected at or above the reported value. The reported value is an estimate.
R	The presence or absence of the analyte can not be determined from the data due to severe quality control problems. The data are rejected and considered unusable. No value is reported with this qualification.
NA	Not Applicable, the parameter was not analyzed for, or there is no analytical result for this parameter. No value is reported with this qualification.

Manchester Environmental Laboratory Report by Parameter for Project TEC-985A

Project Code:

TEC-985A

Project Name:

SOUTH TACOMA CHANNEL SEEP

Project Officer:

BRANDON PERKINS

Account Code:

10T10P302DD2C10ZZLA00

Station Description:

TB01WT

Collected:

9/1/10

14:00:00

Matrix:

Liquid

Sample Number:

10354000

Type:

Reg sample

		Result	Units	Qlfr	
ORG			•		
	ım Hyd, Gasoline			Container ID: A1	
Method: NWTPH-G	Gasoline range organics		An	alysis Date: 9/8/2010	
Prep Method: 5030	Purge and Trap			Prep Date:	
Analytes(s): 8006619	Unleaded gasoline composite	50	mg/L	. U	•
Surrogate(s: 540363	Benzene, 1,4-difluoro-	101	%Rec		

9:40:00

Project Code:

TEC-985A

Project Name:

SOUTH TACOMA CHANNEL SEEP

Project Officer:

BRANDON PERKINS

Account Code:

ORG

Parameter

10T10P302DD2C10ZZLA00

Station Description:

SP01GW

Collected: Matrix:

9/1/10

Liquid

Sample Number:

10354001

Type:

Reg sample

Units Qlfr Result Container ID: A1 Analysis Date: 9/8/2010

: NWTPH-G Method Prep Method: 5030

: Total Petroleum Hyd, Gasoline Gasoline range organics

Purge and Trap

Analytes(s): 8006619 Surrogate(s: 540363

Unleaded gasoline composite

Benzene, 1,4-difluoro-

50 95 mg/L %Rec U

Prep Date:

10354001 Reg sample

3 of

Manchester Environmental Laboratory Report by Parameter for Project TEC-985A

Project Code:

TEC-985A

: Total Petroleum Hyd, Gasoline

: NWTPH-G

8006619

Project Name:

SOUTH TACOMA CHANNEL SEEP

Unleaded gasoline composite

Project Officer:

ORG Parameter

Method

BRANDON PERKINS 10T10P302DD2C10ZZLA00

Account Code: Station Description:

Prep Method: 5030

Surrogate(s: 540363

Collected:

Matrix; Sample Number: Liquid 10354001

Type:

Matrix Spike

	Result	Units	Qlfr	
<i>,</i>				
n Hyd, Gasoline			Container ID:	A2
Gasoline range organics		An	alysis Date: 9/8/20)10
Purge and Trap		•	Prep Date:	
Benzene, 1,4-difluoro-	85	%Rec		
Unleaded gasoline composite	94	%Rec	•	

4 of

Project Code:

TEC-985A

Project Name:

SOUTH TACOMA CHANNEL SEEP

Project Officer:

BRANDON PERKINS

Account Code:

10T10P302DD2C10ZZLA00

Station Description:

Collected:

Matrix:

Sample Number:

Liquid 10354001

Type:

Matrix Spike Dupl

<u> </u>		Result	Units	Olfr
ORG				
Parameter : Total Petroleu	m Hyd, Gasoline	4		Container ID: A3
Method: NWTPH-G	Gasoline range organics		An	alysis Date: 9/8/2010
Prep Method: 5030	Purge and Trap		•	Prep Date:
Surrogate(s: 540363	Benzene, 1,4-difluoro-	87	%Rec	
8006619	Unleaded gasoline composite	97	%Rec	

Manchester Environmental Laboratory Report by Parameter for Project TEC-985A

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Project Code:

TEC-985A

Project Name:

SOUTH TACOMA CHANNEL SEEP

Project Officer:

BRANDON PERKINS

Account Code:

10T10P302DD2C10ZZLA00

Station Description:

SP02GW

Collected:

9/1/10

10:15:00

Matrix: Sample Number: Liquid 10354002

Type:

Reg sample

	· .	 Result	Units	Qlfr
ORG	•			
Parameter : Total Petrole	um Hyd, Gasoline			Container ID: A1
Method: NWTPH-G	Gasoline range organics		An	alysis Date: 9/8/2010
Prep Method: 5030	Purge and Trap			Prep Date:
Analytes(s): 8006619	Unleaded gasoline composite	50	mg/L	U
Surrogate(s: 540363	Benzene, 1,4-difluoro-	86	%Rec	

11:27:00

Project Code:

TEC-985A

Project Name: SOUTH TACOMA CHANNEL SEEP

: NWTPH-G

BRANDON PERKINS

Project Officer: Account Code:

ORG

Method

Parameter

10T10P302DD2C10ZZLA00

Gasoline range organics

Unleaded gasoline composite

Purge and Trap

Benzene, 1,4-difluoro-

Station Description:

Prep Method: 5030

Analytes(s): 8006619

Surrogate(s: 540363

SP03GW

: Total Petroleum Hyd, Gasoline

Collected: Matrix: 9/1/10

Liquid

Sample Number: 1035

10354003

Type:

86

Reg sample

Result Units Olfr

Container ID: A1
Analysis Date: 9/8/2010
Prep Date:

50 mg/L U

%Rec

11/2/10

Manchester Environmental Laboratory Report by Parameter for Project TEC-985A

Page

7 of

9

Project Code:

TEC-985A

Project Name:

SOUTH TACOMA CHANNEL SEEP

Project Officer:

BRANDON PERKINS

Account Code:

10T10P302DD2C10ZZLA00

Collected:

Matrix:

Sample Number:

Liquid JBW0251A

Type:

Blank

Station Description:

		Result	Units	Qlfr	
•	•				
ORG	•				
Parameter : Total Petrole	um Hyd, Gasoline			Container II):
Method: NWTPH-G	Gasoline range organics		Ana	ilysis Date: 9/8,	/2010
Prep Method: 5030	Purge and Trap			Prep Date :	
Analytes(s): 8006619	Unleaded gasoline composite	50	mg/L	U	
Surrogate(s: 540363	Benzene, 1,4-diffuoro-	106	%Rec		

11/2/10

Manchester Environmental Laboratory Report by Parameter for Project TEC-985A

Page 8 of

Project Code:

TEC-985A

Project Name:

SOUTH TACOMA CHANNEL SEEP

Project Officer:

BRANDON PERKINS

Account Code:

10T10P302DD2C10ZZLA00

Station Description:

Collected:

Matrix: Sample Number:

Liquid TPH0251

Type:

LCS

		Result	Units	Qlfr
ORG				
Parameter : Total Petrole	um Hyd, Gasoline	1		Container ID:
Method: NWTPH-G	Gasoline range organics	•	An	alysis Date: 9/8/2010
Prep Method: 5030	Purge and Trap			Prep Date:
Surrogate(s: 540363	Benzene, 1,4-difluoro-	117	%Rec	
8006619	Unleaded gasoline composite	107	%Rec	

11/2/10

Manchester Environmental Laboratory Report by Parameter for Project TEC-985A

Page 9 of

Project Code:

TEC-985A

Project Name:

SOUTH TACOMA CHANNEL SEEP

Project Officer:

BRANDON PERKINS

Account Code:

10T10P302DD2C10ZZLA00

Collected:

Matrix:

Sample Number:

Liquid TPH0251X

Type:

LCSD

Station Description:

Result Units Olfr **ORG Parameter** : Total Petroleum Hyd, Gasoline Container ID: Method : NWTPH-G Gasoline range organics Analysis Date: 9/8/2010 Prep Method: 5030 Purge and Trap Prep Date: Benzene, 1,4-difluoro-90 %Rec Surrogate(s: 540363 8006619 Unleaded gasoline composite 93 %Rec



MEMORANDUM

DATE:

November 22, 2010

TO:

Jeff Fetters, START-3 Project Manager, E & E, Seattle, Washington

FROM:

Mark Woodke, START-3 Chemist, E & E, Seattle, Washington

SUBJ:

Data Summary Check,

South Tacoma Seep Site, Tacoma, Washington

REF:

TDD: 10-05-0004

PAN: 002233.0569.01SI

The data summary check of 4 water samples collected from the South Tacoma Channel Seep site located in Tacoma, Washington, has been completed. Organics (EPA CLP SOW SOM01.2) analyses were performed by A4 Scientific, The Woodlands, Texas.

The samples were numbered:

JD1N2

JD1N3

JD1N4

JD1N5

The following discrepancies were noted: The Summary of Qualifiers Applied section of the validation memorandum didn't list the methylene chloride "U" applied to sample JD1N5 and listed 1,4-dioxane as "U" when it should be qualified "R" in the same sample. The primary reviewer corrected the data validation memorandum.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION 10

1200 Sixth Avenue Seattle, Washington 98101

Date: November 22, 2010

Reply to:

Attn of:

OEA-095

<u>MEMORANDUM</u>

Subject:

Data Validation Report for the Volatile Organic (VOC), Semivolatile Organic (SVOC),

Pesticide & PCB analyses of water samples collected from the South Tacoma Channel

11/22/10

Seep Site

Case Number: 40457

SDG: JC1N2

From:

Raymond Wu, QA Chemist

Office of Environmental Assessment (OEA - 095), USEPA Region 10

To:

Brandon Perkins, Task Monitor

Office of Environmental Clean-up (ECL - 112), USEPA Region 10

CC:

Renee Nordeen, Start 3 Project Leader

Ecology & Environment, Inc.

The quality assurance (QA) review of the analytical data generated from the analysis of four water samples collected from the above referenced site has been completed. These samples were analyzed for VOA, SVOC, Pesticides & PCBs in accordance with the USEPA Contract Laboratory Program (CLP) Statement of Work (SOW) for Multi-Media, Multi-Concentration Organic Analyses (SOM01.2) by A4 Scientific located in The Woodlands, Texas.

All sample analyses were evaluated following EPA's Stage 4 Data Validation Electronic/Manual Process (S4VEM). The validations were conducted and appropriate qualifiers were applied according to the Quality Control Specifications outlined in the Quality Assurance Project Plan for South Tacoma Channel Seep Site in Tacoma, Washington, dated July, 2010, the technical specifications of USEPA CLP SOW for Organic Data Review, the Contract Laboratory Program's National Functional Guidelines for Organic Data Review, the Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use (EPA-540-R08-005). Some of the data quality elements were qualified based on the professional judgment of the reviewer.

A summary of samples evaluated in this validation report and the pertinent dates for sample collection, sample receipt at the laboratory, extraction and analyses is listed in Sample Index Table found at the end of this report.

The conclusions presented herein are based on the information provided for the review.

I. DATA QUALIFICATIONS

Summary of Validation Qualifiers Applied:

After the manual and electronic data review, the following data points were qualified:

Associated Samples	VOA Analyte	Qualifier Detect/Non-detect	Reason for Qualifier
личения и при водиненти в	Methylene Chloride	U	MB
	1,4-Dioxane	R	RRF
JD1N3	Methylene Chloride	U	MB
	1,4-Dioxane	R	RRF
${ m JD1N4}$	Methylene Chloride		MB
والمرافق	1,4Dioxane	Resident from many construction to be desired as for indicated a formal parameters and the second construction of the first of the second construction of th	RRF
JD1N5	Methylene Chloride	U	MB
Belowskie wie der der en der en er en en en der der ender de der de der en	1,4-Dioxane	R	RRF

Data Qualifiers

The following is a list of validation qualifiers applied to the sample result(s) when needed to indicate associated out-of-control QA/QC results.

		Data Qualifiers
And the second s	U	The analyte was not detected at or above the reported result.
Livora Kalibah Perpi	J	The analyte was positively identified. The associated numerical result is an estimate.
	UJ	The analyte was not detected at or above the reported estimated result. The associated numerical value is an estimate of the quantitation limit of the analyte in this sample.
	R	The data are unusable for all purposes.
	N	There is evidence the analyte is present in this sample.
	JN	There is evidence that the analyte is present. The associated numerical result is an estimate.

For site assessment and investigations, the following bias qualifiers are applied to the data in addition to the above data qualifiers when necessary to allow for data analysis and interpretation using Pre-Score software calculations for National Priority Listing Hazard Ranking Scoring (NPL-HRS).

	Bias Qualifiers						
Andrews and the state of the st	L	Low bias.					
#107-0-70 L-8-000	H	High bias.					
	Q	The result is estimated because the concentration is below the Contract Required Quantitation Limits (CRQLs).					
	K	Unknown Bias					

Reasons for Validation Qualifiers

The reasons for applying a validation qualifier to a sample result are also listed in the validated electronic data deliverables (EDDs), under the column header "Reasons". Below is a list of reasons why a data point could be qualified during data validation.

	Reasons for Validation Qualifiers:
<crql< th=""><th>The value reported is <contract (crqls)<="" limits="" quantitation="" required="" th=""></contract></th></crql<>	The value reported is <contract (crqls)<="" limits="" quantitation="" required="" th=""></contract>
%D	The percent difference (%D) of the concentrations calculated off the primary and secondary columns are >60% and were qualified estimated.
MULT	Multiple runs were conducted for the analyte. Use the other value reported for the same analyte. The value which is not to be used is qualified 'R'.
USE R1	Use the value(s) reported off the initial analytical run
USE DIL	The value reported is over the calibration range. Use the value reported off the dilution run.
USE SIM	The value reported off the SIM run
USE SIM DIL	The value reported is over the calibration range. Use the value reported off the SIM dilution run.
SURR/DMCs	The surrogate/deuterated monitoring compound (DMC) recoveries did not meet the specified control limits. Results are qualified estimated.
RRF	The response factor for the analyte did not meet the minimum acceptance criteria (0.01).
MS/MSD	The spiked recoveries and/or RPDs did not meet the specified control limits. Results are qualified estimated.
MB	Analyte was qualified as non-detect due to contamination in the associated blank. The value reported is <5x or <10x (if common lab contaminant) the value in the blank.
ND	The analyte was not detected in the sample, and is reported at the CRQL with the 'U' Qualifier.
COELN	Initial identification erroneous, Peak due to co-elution with other detected target analytes.
ICAL	Initial Calibration criteria not met Continuing calibration criteria not met
CCV	Internal standard criteria not met
IS	GPC Clean-up criteria not met.
GPC	
CLN-UP	Silica gel, alumina or sulfur clean-up criteria not met
LCS	LCS/LCSD criteria not met
HT	Holding time criteria not met
STORE	Sample Storage and preservation specified not met
TEMP	Cooler recommended temperature exceeded at the verified time of sample receipt at the lab (VTSR)

M/Z	Mass/ion resolution ratio not met
DPE	Diphenyl ether interferences. False positive. Elevate reporting limits at level of detection
< CRQL	Positive hits under the contract required quantitation limit
R	Data is unusable
IS	Internal standard out of QC range
OLR	Over the linear range

II. DATA REVIEW

The analytical data were evaluated following the recommended baseline checks used in the four stages of laboratory analytical data verification and validation for Superfund use listed as follows (EPA-540-R08-005, 2009):

				Stage I – Data Validation
	Verified YES NO		N/A	OC Procedure or Check
L			1 17 5%	QUITOCOMIC OF CINCON
- Park	X			Documentation identifies the laboratory receiving and conducting analyses, and includes documentation for all samples submitted by the project or requester for analyses.
2	X			Requested analytical methods were performed and the analysis dates are present.
3	X		TANK TANK TANK TANK TANK TANK TANK TANK	Requested target analyte results are reported along with the original laboratory data qualifiers and data qualifier definitions for each reported result
4	X			Requested target analyte result units are reported
10	X			Requested reporting limits for all samples are present and results at and below the requested (required) reporting limits are clearly identified (including sample detection limits if required).
6	X			Sampling dates (including times if needed), date and time of laboratory receipt of samples, and sample conditions upon receipt at the laboratory (including preservation, pH and temperature) are documented.
7	X			Sample results are evaluated by comparing sample conditions upon receipt at the laboratory (e.g., preservation checks) and sample characteristics (e.g., percent moisture) to the requirements and guidelines present in national or regional data validation documents, analytical method(s) or contract.

	Stage 2A - Data Validation						
	Ver	fied	N/A	OC Procedure or Check			
	YES	NO	13/73	QUE TOURIST OF CHICAL			
8	Χ			Requested methods (handling, preparation, cleanup, and analytical) are performed.			
9				Method dates (including dates, times and duration of analysis for radiation counting measurements and other methods, if needed) for handling (e.g., Toxicity Characteristic Leaching Procedure),			
	X			preparation, cleanup and analysis are present, as appropriate.			

	_		Case wealth apply setting
10	X		Requested spike analytes or compounds (e.g., surrogate, DMCs, LCS spikes, post digestion spikes) have been added, as appropriate.
11	X		Sample holding times (from sampling date to preparation and preparation to analysis) are evaluated.
12	X		Frequency of QC samples is checked for appropriateness (e.g., one LCS per twenty samples in a preparation batch).
13	X		Sample results are evaluated by comparing holding times and sample-related QC data to the requirements and guidelines present in national or regional data validation documents, analytical method(s) or contract
			Stage 2A – Data Validation QC Data
14	Х		method blanks
15	X		surrogate recoveries/deuterated monitoring compounds (DMC) recoveries
16	X		laboratory control sample (LCS) recoveries
17	X		matrix spike and matrix spike duplicate recoveries
18		X	serial dilutions
19		X	post digestion spikes
20		X	standard reference materials
21		X	equipment blanks
22		X	trip blanks

Stage 2B - Data Validation

Stage 2B validation builds on the validation conducted in Stage 2A. Stage 2B validation of the laboratory analytical data package consists of the Stage 2A validation plus the verification and validation checks for the compliance of instrument-related QC.

-	Ver	Verified		OC Through an Charle
	YES	NO	N/A	QC Procedure or Check
23	X			Initial calibration data (e.g., ICAL standards, ICV standards, ICBs) are provided for all requested analytes and linked to field samples reported. For each initial calibration, the calibration type used is present along with the initial calibration equation used including any weighting factor(s) applied and the associated correlation coefficients, as appropriate. Recalculations of the standard concentrations using the initial calibration curve are present, along with their associated percent recoveries, as appropriate (e.g., if required by the project, method, or contract). For the ICV standard, the associated percent recovery (or percent difference, as appropriate) is present.
24	X	***************************************		Appropriate number and concentration of initial calibration standards are present.
25	х			Continuing calibration data (e.g. CCV standards and CCBs) are provided for all requested analytes and linked to field samples reported, as appropriate. For the CCV standard(s), the associated percent recoveries (or percent differences, as appropriate) are present.
26	Х	***************************************		Reported samples are bracketed by CCV standards and CCBs standards as appropriate.
27	X			Method specific instrument performance checks are present as appropriate (e.g., tunes for mass spectrometry methods, DDT/Endrin breakdown checks for pesticides and aroclors, instrument blanks and interference checks for ICP methods).
28	Х			Frequency of instrument QC samples is checked for appropriateness (e.g., gas chromatography-mass spectroscopy [GC-MS] tunes have been run every 12 hours).

Stage 3 - Data Validation

Stage 3 validation builds on the validation conducted in Stage 2B. Stage 3 validation of the laboratory analytical data package consists of the Stage 2B validation plus the recalculation of instrument and sample results from the laboratory instrument responses, and comparison of recalculated results to laboratory reported results.

	Verified		N/A	QC Procedure or Check
	YES	NO	14174	Conferme or curer
29	X			Instrument response data (e.g., GC peak areas, ICP corrected intensities) are reported for requested analytes, surrogates, internal standards, and DMCs for all requested field samples, matrix spikes, matrix spike duplicates, LCS, and method blanks as well as calibration data and instrument QC checks (e.g., tunes, DDT/Endrin breakdowns, inter-element correction factors, and Florisil cartridge checks).
30	X			Reported target analyte instrument responses are associated with appropriate internal standard analyte(s) for each (or selected) analyte(s) (for methods using internal standard for calibration).
31	X			Fit and appropriateness of the initial calibration curve used or required (e.g., mean calibration factor, regression analysis [linear or non-linear, with or without weighting factors, with or without forcing]) is checked with recalculation of the initial calibration curve for each (or selected) analyte(s) from the instrument response.
32	X		A STATE OF THE PARTY AND	Comparison of instrument response to the minimum response requirements for each (or selected) analyte(s).
33	X	- Harrison Private	,	Recalculation of each (or selected) opening and closing CCV (and CCB) response from the peak data reported for each (or selected) analyte(s) from the instrument response, as appropriate.
34	X			Compliance check of recalculated opening and/or closing CCV (and CCB) response to recalculated initial calibration response for each (or selected) analyte(s).
35	X			Recalculation of percent ratios for each (or selected) tune from the instrument response, as appropriate.
36	x			Compliance check of recalculated percent ratio for each (or selected) tune from the instrument response.
37	X		, , , , , , , , , , , , , , , , , , ,	Recalculation of each (or selected) instrument performance check (e.g., DDT/Endrin breakdown for pesticide analysis, instrument blanks, interference checks) from the instrument response.
38	X			Recalculation and compliance check of retention time windows (for chromatographic methods) for each (or selected) analyte(s) from the laboratory reported retention times.
39	X	er annumerkelk in Erichalder a werk	3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Recalculation of reported results for each reported (or selected) target analyte(s) from the instrument response.
40	X			Recalculation of each (or selected) reported spike recovery (surrogate recoveries, DMC recoveries, LCS recoveries, duplicate analyses, matrix spike and matrix spike duplicate recoveries, serial dilutions, post digestion spikes, standard reference materials etc.) from the instrument response.
41	x			Each (or selected) sample result(s) and spike recovery(ies) are evaluated by comparing the recalculated numbers to the laboratory reported numbers according to the requirements and guidelines present in national or regional data validation documents, analytical method(s) or contract

Note: Selection of analytes, spikes, and performance evaluation checks for the Stage 3 validation checks for a laboratory analytical data package being verified and validated generally will depend on many factors including (but not limited to) the type of verification and validation being performed (manual or electronic), requirements and guidelines present in national or regional data validation documents, analytical method(s) or contract, the number of laboratories reporting the data, the number and type of analytical methods reported, the number of analytes reported in each method, and the number of detected analytes.

nerisa Veren				Stage 4 – Data Validation	
				ne validation conducted in Stage 3. Stage 4 validation of the laboratory analytical data package consists of the aluation of instrument outputs.	
	***********	ified NO	N/A	QC Procedure or Check	

Data Validation Report for VOA Analyses South Tacoma Channel Seep Site Case 40209 SDG JC1N2

		COO (VEG OD G FOILE
42	x	All required instrument outputs (e.g., chromatograms, mass spectra, atomic emission spectra, instrument background corrections, and interference corrections) for evaluating sample and instrument performance are present.
43	X	Sample results are evaluated by checking each (or selected) instrument output (e.g., chromatograms, mass spectra, atomic emission spectra data, instrument background corrections, interference corrections) for correct identification and quantitation of analytes (e.g., peak integrations, use of appropriate internal standards for quantitation, elution order of analytes, and interferences).
44	X	 Each (or selected) instrument's output(s) is evaluated for confirmation of non-detected or tentatively identified analytes.

Note: Selection of instrument outputs for the Stage 4 validation checks for a laboratory analytical data package being verified and validated generally will depend on many factors including, but not limited to, the type of verification and validation being performed (electronic or manual), requirements and guidelines present in national or regional data validation documents, analytical method(s) or contract, the number of laboratories reporting the data, the number and type of analytical methods reported, the number of analytes reported in each method, and the number of detected analytes.

Attachments in the email:

Summary of Samples Analyzed (Sample Index) Summary of Electronic Data Review Validated Electronic Data Deliverables

1A - FORM I VOA-1 VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO. JD1N2

Lab Name:	A4 SCIEN	TIFIC,	INC.	_ _	Contract:	EPW	705036	
Lab Code: F	14 Case	No.:	40457	Mod.	Ref No.:	SDG No.:	JD1	.N2
Matrix: (SOII	J/SED/WATER	.)	WATER	_	Lab Sample ID:	00	012690-01	
Sample wt/vol	.: 5.00	(g/mL)	щL	···	Lab File ID:	H.	3145.D	
Level: (TRACE	I/LOW/MED)	j	POM	··-	Date Received:	0.9	3/03/2010	
% Moisture: n	iot dec.	*************************		w-	Date Analyzed:	09	/09/2010	
GC Column:	DB-624	ID:	0.20	(mm)	Dilution Factor:	:	1.0	
Soil Extract	Volume:			(uL)	Soil Aliquot Vol	lume:		(uL)
Purge Volume:		5.0		(mL)				
CAS NO.	COMPOUND					FRATION UN		Q

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg)ug/L	Q
75-71-8	Dichlorodifluoromethane	5.0	U
74-87-3	Chloromethane	5.0	Ū
75-01-4	Vinyl chloride	5.0	Ū
74-83-9	Bromomethane	5.0	Ū
75-00-3	Chloroethane	5.0	ט
75-69-4	Trichlorofluoromethane	5.0	Ü
75-35-4	1,1-Dichloroethene	5.0	ū
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	5.0	Ū
67-64-1	Acetone	13	Alle
75-15-0	Carbon disulfide	5.0	U
79-20-9	Methyl acetate	5.0	ט
75-09-2	Methylene chloride	9.7	ZU
156-60-5	trans-1,2-Dichloroethene	5.0	Ū
1634-04-4	Methyl tert-butyl ether	5.0	ט
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	cis-1,2-Dichloroethene	5.0	Ū
78-93-3	2-Butanone	10	U
74-97-5	Bromochloromethane	5.0	Ū
67-66-3	Chloroform	5.0	Ü
71-55-6	1,1,1-Trichloroethane	5.0	U
110-82-7	Cyclonexane	5.0	Ū,
56-23-5	Carbon tetrachloride	5.0	U
71-43-2	Benzene	5.0	U
107-06-2	1,2-Dichloroethane	5.0	U
123-91-1	1,4-Dioxane	100	XR

Report 1,4-Dioxane for Low-Medium VOA analysis only

1E - FORM I VOA-2 VOLATILE ORGANICS ANALYSIS DATA SHEET

 EPA	SAMPLE	NO.	
	JD1N2		

Lab Name:	A4 SCIEN	TIFIC,	INC.	_	Contract:	EPW05(036
Lab Code:	A4 Case	No.:	40457	Mod.	Ref No.:	SDG No.:	JD1N2
Matrix: (SO	IL/SED/WATER	९)	WATER	_	Lab Sample ID:	0012	590-01
Sample wt/v	ol: <u>5.00</u>	(g/mL)	mL		Lab File ID:	H314	5.D
Level: (TRA	CE/LOW/MED)		LOW	-	Date Received:	09/03	3/2010
% Moisture:	not dec.			_	Date Analyzed:	09/09	/2010
GC Column:	DB-624	ID:	0.20	(mm)	Dilution Factor:		1.0
Soil Extract	t Volume:			(uL)	Soil Aliquot Vol	ume:	(uL)
Purge Volume	a:	5.0		(mL)			

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg)ug/L	Ω
79-01-6	Trichloroethene	5.0	U
108-87-2	Methylcyclohexane	5.0	Ū
78-87-5	1,2-Dichloropropane	5.0	Ü
75-27-4	Bromodichloromethane	5.0	U
10061-01-5	cis-1,3-Dichloropropene	5.0	ם
108-10-1	4-Methyl-2-pentanone	10	Ū
108-88-3	Toluene	5.0	U
10061-02-6	trans-1,3-Dichloropropene	5.0	Ü
79-00-5	1,1,2-Trichloroethane	5.0	Ū
127-18-4	Tetrachloroethene	5.0	U
591-78-6	2-Hexanone	1.0	U
124-48-1	Dibromochloromethane	5.0	U
106-93-4	1,2-Dibromoethane	5.0	U
108-90-7	Chlorobenzene	5.0	Ų
100-41-4	Ethylbenzene	5.0	Ü
95-47-6	o-Xylene	5.0	Ü
179601-23-1	m,p-Xylene	5.0	U
100-42-5	Styrene	5.0	Ū
75-25-2	Bromoform	5.0	Ū
98-82-8	Isopropylbenzene	5.0	ם
79-34-5	1,1,2,2-Tetrachloroethane	5.0	Ų
541-73-1	1,3-Dichlorobenzene	5.0	U
106-46-7	1,4-Dichlorobenzene	5.0	U
95-50-1	1,2-Dichlorobenzene	5.0	U
96-12-8	1,2-Dibromo-3-chloropropane	5.0	υ
120-82-1	1,2,4-Trichlorobenzene	5.0	U
87-61-6	1,2,3-Trichlorobenzene	5.0	U

1J - FORM I VOA-TIC VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

EPA	SAMPLE	NO.
	JD1N2	

	Lab Name: A4 SCIENTI	FIC, INC.			Contra	act:	EPW(5036
	Lab Code: A4 Case No.:	40457	Mod. Ref	No.	:	SDG	No.:	JD1N2
	Matrix: (SOIL/SED/WATER)							
	Sample wt/vol: 5.00 (g/mI				File ID:			
	Level: (TRACE or LOW/MED)				e Received			
	% Moisture: not dec.			Date	e Analyzed	 l:	09/09/	2010
	GC Column: DB-624 I						***************************************	
	Soil Extract Volume: CONCENTRATION UNITS: (ug/L or						5.0	
	p							
)1		OMPOUND NAME			RT	ES	T. CONC.	Q
)2								
)3			·····					
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	E966796 ¹ Total Alk	anes -			N/A			· ·

¹EPA-designated Registry Number.

1A - FORM I VOA-1 VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

JD1N3

Lab Name:	A4 SCIENT	TFIC, I	INC.	_	Contract;	EPW050	36
Lab Code: A	4 Case N	o.:	40457	Mod.	Ref No.:	SDG No.:	JD1N2
Matrix: (SOIL	/sed/water)	Ţ.	VATER		Lab Sample ID:	00126	90-02
Sample wt/vol	: 5.00	(g/mL)	mL	_	Lab File ID:	H314	i.D
Level: (TRACE	/LOW/MED)	L	WO		Date Received:	09/03	/2010
% Moisture: no	ot dec.			_	Date Analyzed;	09/09	/2010
GC Column:	DB-624	ID:	0.20	(mm)	Dilution Factor:		1.0
Soil Extract	Volume:			(uL)	Soil Aliquot Volu	ıme:	(uL)
Purge Volume:		5.0		- (mL)			

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg)ug/L	Q
75-71-8	Dichlorodifluoromethane	5.0	Ū
74-87-3	Chloromethane	5.0	U
75-01-4	Vinyl chloride	5.0	ū
74-83-9	Bromomethane	5.0	Ü
75-00-3	Chloroethane	5.0	Ū
75-69-4	Trichlorofluoromethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	ΰ
76-13-1	. 1,1,2-Trichloro-1,2,2-trifluoroethane	5.0	ט
67-64-1	Acetone	10 -4-7 m	
75-15-0	Carbon disulfide	5.0	נו
79-20-9	Methyl acetate	5.0	Ū
75-09-2	Methylene chloride	8.9	P" U
156-60-5	trans-1,2-Dichloroethene	5.0	Ü
1634-04-4	Methyl tert-butyl ether	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	cis-1,2-Dichloroethene	5.0	Ū
78-93-3	2-Butanone	10	U
74-97-5	Bromochloromethane	5.0	U
67-66-3	Chloroform	5.0	U
71-55-6	1,1,1-Trichloroethane	5.0	U
110-82-7	Cyclohexane	5.0	U
56-23-5	Carbon tetrachloride	5.0	Ū
71-43-2	Benzene	5.0	Ū
107-06-2	1,2-Dichloroethane	5.0	U.
123-91-1	1,4-Dioxane	100	BR

Report 1,4-Dioxane for Low-Medium VOA analysis only

11/18/10

1B - FORM I VOA-2 VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

JD1N3

Lab Name:	A4 SCIEN	TIFIC,	INC.		Contract:	E.	EPW05036		
Lab Code: A	4 Case	No.:	40457	_ Mod.	Ref No.:	SDG No.	; JD1N	12	
Matrix: (SOIL/SED/WATER) WATER					Lab Sample ID:	0012690-02			
Sample wt/vol	: 5.00	(g/mL)	mL		Lab File ID:		H3144.D		
Level: (TRACE/LOW/MED) LOW					Date Received:	09/03/2010			
% Moisture: n	ot dec.			_	Date Analyzed:	C	9/09/2010		
GC Column:	DB-624	ID:	0.20	(mm)	Dilution Factor:	1.0		-	
Soil Extract	Volume:			(uL)	Soil Aliquot Vol	ume:		(uL)	
Purge Volume:		5.0		(mL)					
			//		CONCENT	RATION L	INITS:		

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg)ug/L	Q
79-01-6	Trichloroethene	1.2	
108-87-2	Methylcyclohexane	5.0	U
78-87-5	1,2-Dichloropropane	5.0	ט
75-27-4	Bromodichloromethane	5.0	υ
10061-01-5	cis-1,3-Dichloropropene	5.0	ט
108-10-1	4-Methyl-2-pentanone	10	ט
108-88-3	Toluene	5.0	ט
10061-02-6	trans-1,3-Dichloropropene	5.0	יט
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	5.0	U
591-78-6	2-Hexanone	10	U
124-48-1	Dibromochloromethane	5.0	U
106-93-4	1,2-Dibromoethane	5.0	ט
108-90-7	Chlorobenzene	5.0	Ω
100-41-4	Ethylbenzene	5.0	ū
95-47-6	o-Xylene	5.0	Ū
179601-23-1	m,p-Xylene	5.0	Ū
100-42-5	Styrene	5.0	Ū
75-25-2	Bromoform	5.0	Ü
98-82-8	Isopropylbenzene	5.0	ט
79-34-5	1,1,2,2-Tetrachloroethane	5.0	บ
541-73-1	1,3-Dichlorobenzene	5.0	U
106-46-7	1,4-Dichlorobenzene	5.0	Ü
95-50-1	1,2-Dichlorobenzene	5.0	ט
96-12-8	1,2-Dibromo-3-chloropropane	5.0	Ü
120-82-1	1,2,4-Trichlorobenzene	5.0	U
87-61-6	1,2,3-Trichlorobenzene	5.0	Ū

1J - FORM I VOA-TIC VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

	EPA	SAMPLE	NO.	
*********				_
		JD1N3		

						1		
Lab Name: A4 SCIENTIFIC, INC.					Contra	ct:	EPW05	3036
Lab Code: A4	_ Case No.:	40457	Mod. Ref	No.	•	SDG No	·.:	JD1N2
Matrix: (SOIL/SE	D/WATER)	WATER		Lab	Sample ID	:	0012690)-02
Sample wt/vol:					File ID:			
Level: (TRACE or	LOW/MED)	LOW		Date	Received		09/03/2	010
% Moisture: not	dec.			Date	a Analyzed	:	09/09/2	010
GC Column:	DB-624 ID	0.20	(mm)	Dilı	ition Fact	or:	1.0	0
Soil Extract Vol	ume:		(uL)	Soil	l Aliquot	Volume:		(น上)
CONCENTRATION UN								(mL)
CAS NUMBER	GO	MPOUND NAM	E		RT	EST.	CONC.	Q
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29 30							***************************************	
E966796 ¹	Total Alka	nes			n/A	·····		

¹EPA-designated Registry Number.

1A - FORM I VOA-1 VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

JD1N4

Lab Name: A4 SCIENTIE		TIFIC, I	INC.	Contract:		EPW05036		
Lab Code:	A4 Case N	lo.:	40457	Mod.	Ref No.:	SDG No.:	JD1N2	
Matrix: (SOIL/SED/WATER) WATER					Lab Sample ID:	00126	90-03	
Sample wt/vol: 5.00 (g/mL)			mL	_	Lab File ID:	H314	6.D	
Level: (TRACE/LOW/MED) LOW				_	Date Received:	09/03/2010		
% Moisture:	not dec.				Date Analyzed:	09/09/2010		
GC Column:	DB-624	ID:	0.20	(mm)	Dilution Factor:		1.0	
Soil Extract Volume:				(uL)	Soil Aliquot Volu	me:	(uL)	
Purge Volume	:	5.0		(mL)				

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg)ug/L	Q
75-71-9	Dichlorodifluoromethane	5.0	U
74-87-3	Chloromethane	5.0	ū
75-01-4	Vinyl chloride	5.0	ט
74-83-9	Bromomethane	5.0	Ū
75-00-3	Chloroethane	5.0	Ū
75-69-4	Trichlorofluoromethane	5.0	Ū
75-35-4	1,1-Dichloroethene	5.0	Ū
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	5.0	Ū
67-64-1	Acetone	13	
75-15-0	Carbon disulfide	5.0	U
79-20-9	Methyl acetate	5.0	ט
75-09-2	Methylene chloride	В.3	BU
156-60-5	trans-1,2-Dichloroethene	5.0	Ū
1634-04-4	Methyl tert-butyl ether	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	cis-1,2-Dichloroethene	5.0	ט
78-93-3	2-Butanone	10	U
74-97-5	Bromochloromethane	5.0	Ü
67-66-3	Chloroform	5.0	ט
71-55-6	1,1,1-Trichloroethane	5.0	Ū
110-82-7	Cyclohexane	5.0	Ü .
56-23-5	Carbon tetrachloride	5.0	U
71-43-2	Benzene	5.0	U
107-06-2	1,2-Dichloroethane	5.0	U
123-91-1	1,4-Dioxane	100	NR

Report 1,4-Dioxane for Low-Medium VOA analysis only

1B - FORM I VOA-2 VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

JD1N4

Lab Name:	A4 SCIENTIFIC, INC.	Contract:			EPW05036		
Lab Code: 1	A4 Case No.: 40457	Mod.	Ref No.:		SDG No.:	JD	1N2
Matrix: (SOII	L/SED/WATER) WATER	Lab Sample ID:			0012690-03		3
Sample wt/vol	L: 5.00 (g/mL) mL	-	Lab File	ID:	нз	146.D	
Level: (TRACE	S/LOW/MED) LOW	~	Date Rec	eived:	09.	/03/2010	1
·		-					·····
% Moisture: r	not dec.	<u>.</u>	Date Ana	Tyzed:	09/	09/2010	·································
GC Column:	DB-624 ID: 0.20	(mm)	Dilution	Factor:		1.0	
Soil Extract	Volume:	(uL)	Soil Ali	quot Vol	ume:		(uL)
Purge Volume:	5.0	 (mL)					
CAS NO.	COMPOUND				RATION UNI r ug/kg) <u>ug</u>		Q
79-01-6	Trichloroethene				5.0		ט
108-87-2	Methylcyclchexane				5.0		U
78-87-5	1,2-Dichloropropane				5.0		Ū
75-27-4	Bromodichloromethane				5.0		U
10061-01-5	cis-1,3-Dichloropropene				5.0		U
108-10-1	4-Methyl-2-pentanone				10		U
108-88-3	Toluene	,			5.0		Ü
10061-02-6	trans-1,3-Dichloropropen	2		5.0		ט	
79-00-5	1,1,2-Trichloroethane				5.0		υ
127-18-4	Tetrachloroethene				5.0		Ų
591-78-6	2-Hexanone				10		U
124-48-1	Dibromochloromethane				5.0		Ü
106-93-4	1,2-Dibromoethane				5.0		Ų
108-90-7	Chlorobenzene				5.0		U
100-41-4	Ethylbenzene				5.0		U
95-47-6	c-Xylene				5.0		U
179601-23-1	m,p-Xylene				5.0		Ū
100-42-5	Styrene				5.0		Ŭ
75-25-2	Bromoform				5.0		U.
98-82-8	Isopropylbenzene				5.0		U
79-34-5	1,1,2,2-Tetrachloroethans	>			5.0		U
541-73-1	1,3-Dichlorobenzene				5.0		U
106-46-7	1,4-Dichlorobenzene				5.0		U
Q5_50_1	1 2mDichlorobenzone				5.0		F1

96-12-8

120-82-1

87-61-6

1,2-Dibromo-3-chloropropane

1,2,4-Trichlorobenzene

1,2,3-Trichlorobenzene

U

U

5.0

5.0

5.0

1J - FORM I VOA-TIC VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

EP	A SA	MPLE	NO	
	JI	D1N4		

	Lab Nam	e:	<u> </u>	A4 s	CIENTIFI	C, INC.				Contrac	ct:	E	PW0503	36
	Lab Cod	le:	A4	Case	No.:	40457	Mod			:				
	Matrix:	(SO	IL/SE	D/WATE	R)	WATER			Lab	Sample ID:	-	001	2690-0)3
	Sample	wt/v	ol:	5.00	(g/mL)	ml:				File ID:			46.D	
						LOW			Date	e Received:		09/0)3/201	.0
	% Moist	ure:	not o	dec.					Date	e Analyzed:		09/0	9/201	0
	GC Colu	mn:	1	DB-624	ID:	0.20	(1	mm)	Dili	ution Facto	r:		1.0	
	Soil Ex						(uL)	Soil	L Aliquot V	olum	ne:		(uL)
	CONCENT	RATI	ON UN	ITS: (u						ge Volume:				
	CAS	NUM	BER		COM	POUND NAM	E .			RT	ES	T. CONC	$\overline{}$	Q
01														
02 03						······································				······································				
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	E966796	5 ¹		Tot	al Alkan	es				N/A				

EPA-designated Registry Number.

1A - FORM I VOA-1. VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

JD1N5

							JDIN5	
Lab Name: A4 SCIENTIFIC, INC.			Contract:		:	EPW05036		
Lab Code:	A4 Case No.:	40457	Mod.	Ref No.:	SD	G No.:	JD11	J2
Matrix: (SOI	L/SED/WATER)	WATER		Lab Samp	le ID:	0012	690-04	<u></u>
Sample wt/vo	1: 5.00 (g/	mL) mL′	_	Lab File	ID:	H3147.D		
Level: (TRACE/LOW/MED) LOW		_	Date Rec	eived:	09/0	3/2010		
% Moisture: not dec.			Date Ana	lyzed:	09/09	9/2010		
GC Column:	DB-624	ID: 0.20	(mm.)	Dilution	Factor:		1.0	
Soil Extract	Volume:		(uL)	Soil Ali	quot Volume	. 2		(uL)
Purge Volume	: 5	. 0	(mL)					_
CAS NO.	COMPOUND		***************************************		CONCENTRAT		-	Q
75-71-8	Dichlorodiflu	oromethane	*****************	5.0		5.0		Ü
74-87-3	Chloromethane		***************************************	5.0		5.0		U
75-01-4	Vinyl chlorid	e ·	5.0			5.0		Ü
74-83-9	Bromomethane					5.0		Ü
75-00-3	Chloroethane				111	5.0		Ū
75-69-4	Trichlorofluo	romethane				5.0		U
75-35-4	1,1-Dichloroe	thene		Market Control of the		5.0		U
76-13-1	1,1,2-Trichlo	ro-1,2,2-tr	ifluor	oethane		5.0		U
67-64-1	Acetone			30				
75-15-0 Carbon disulfide					5.0 t			U

	2	4.0	1 0
74-83-9	Bromomethane	5.0	ט
75-00-3	Chloroethane	5.0	Ü
75-69-4	Trichlorofluoromethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	5.0	ט
67-64-1	Acetone	30	
75-15-0	Carbon disulfide	5.0	U
79-20-9	Methyl acetate	5.0	U
75-09-2	Methylene chloride	9.0	₽'U
156-60-5	trans-1,2-Dichloroethene	5.0	ט
1634-04-4	Methyl tert-butyl ether	5.0	ט
75-34-3	1,1-Dichloroethane	5.0	Ú
156-59-2	cis-1,2-Dichloroethene	5.0	U
78-93-3	2-Butanone	10	ט
74-97-5	Bromochloromethane	5.0	U
67-66-3	Chloroform	5.0	Ū
71-55-6	1,1,1-Trichloroethane	5.0	U
110-82-7	Cyclohexane	5.0	U
56-23-5	Carbon tetrachloride	5.0	ט
71-43-2	Benzene	5.0	ט
107-06-2	1,2-Dichloroethane	5.0	U
123-91-1	1,4-Dioxane	100	Je ⁶² 62

123-91-1 1,4-Dioxane

Report 1,4-Dioxane for Low-Medium VOA analysis only

1B - FORM I VOA-2 VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA	SAMPLE	NO.	
	TD1N5		

Lab Name: _	A4 SCIENT	PIFIC, I	NC.	-	Contract:	EPW05	036	
Lab Code:	A4 Case N	10.1	10457	Mod.	Ref No.:	SDG No.:	JD1N2	
Matrix: (SO	IL/SED/WATER)) <u>v</u>	ATER		Lab Sample ID:	0012	2690-04	
Sample wt/v	ol: 5.00	(g/mL)	mL	_	Lab File ID:	н31	47.D	
Level: (TRA	CE/LOW/MED)	L	OW	-	Date Received:	09/0	3/2010	
% Moisture:	not dec.				Date Analyzed:	09/0	9/2010	
GC Column:	DB-624	ID:	0.20	(mm)	Dilution Factor:		1.0	
Soil Extrac	t Volume:			(uL)	Soil Aliquot Vol	ume:	(uL)	
Purge Volum	e:	5.0		- (mL)	•			

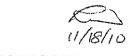
070 110	COMPOUND	CONCENTRATION UNITS:	
CAS NO.	COMPOUND	(ug/L or ug/kg)ug/L	Q
79-01-6	Trichloroethene	2.1	JQ
108-87-2	Methylcyclohexane	5.0	Ū
78-87-5	1,2-Dichloropropane	5.0	U
75-27-4	Bromodichloromethane	5.0	Ū
10061-01-5	cis-1,3-Dichloropropene	5.0	Ū
108-10-1	4-Methyl-2-pentanone	10	U
108-88-3	Toluene	5.0	Ū
10061-02-6	trans-1,3-Dichloropropene	5.0	Ū
79-00-5	1,1,2-Trichloroethane	5.0	Ü
127-18-4	Tetrachloroethene	5.0	U
591-78-6	2-Hexanone	10	U
124-48-1	Dibromochloromethane	5.0	U
106-93-4	1,2-Dibromoethane	5.0	U
108-90-7	Chlorobenzene	5.0	U
100-41-4	Ethylbenzene	5.0	U
95-47-6	o-Xylene	5.0	U
179601-23-1	m,p-Xylene	5.0	Ü
100-42-5	Styrene	5.0	Ū
75-25-2	Bromoform	5.0	ט
98-82-8	Isopropylbenzene	5.0	Ü
79-34-5	1,1,2,2-Tetrachloroethane	5.0	Ū
541-73-1	1,3-Dichlorobenzene	5.0	Ū
106-46-7	1,4-Dichlorobenzene	5.0	Ū.
95-50-1	1,2-Dichlorobenzene	5.0	U
96-12-8	1,2-Dibromo-3-chloropropane	5.0	Ü
120-82-1	1,2,4-Trichlorobenzene	5.0	Ū
87-61-6	1,2,3-Trichlorobenzene	5.0	υ

1J - FORM I VOA-TIC VOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

EPA	SAMPLE	NO.	
	JD1N5		

								F	
	Lab Name:	A4 SCIENTIFI	C, INC.			Contra	ict:	EPI	W05036
	Lab Code: A4	Case No.:	40457	Mod. Ref	No.	:	SDG	No.:	JD1N2
	Matrix: (SOIL/SED	/WATER)	WATER		Lab	Sample ID	:	0012	690-04
	Sample wt/vol:	- Indiana				File ID:	-		
	Level: (TRACE or				Dat	e Received	:	09/03	3/2010
	% Moisture: not d			-	Date	e Analyzed	:	09/09	/2010 .
	GC Column: E	DB-624 ID:	0.20	(mm.)					1.0
	Soil Extract Volu	ime:		(uL)	Soi	l Aliquot	- Volum		(uL)
	CONCENTRATION UNI								(mL)
	CAS NUMBER	COM	IPOUND NAME	······································		RT	ES'	T. CONC.	
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ĺ	E966796 ¹	Total Alkar	168			N/A			

¹EPA-designated Registry Number.

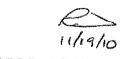


1D - FORM I SV-1 SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

JD1N3

Lab Name:	44 SCIENTIFIC, INC.	Contr	act:	EPW05036	
Lab Code: A4	Case No.: 40457	Mod. Ref No.	:SDG	3 No.:	JD1N2
	CD/WATER) WATER		ample ID:		
Sample wt/vol:	1000 (g/mL) mL	Lab F	ile ID:	D7300.I	>
Level: (LOW/MED)	LOW		ction: (Type)		
Moisture:	Decanted: (Y/N)	Date	Received:	09/03.	/2010
	ract Volume: 1000		Extracted:	09/07	/2010
Injection Volume	: 1.0 (uL) GPC Factor	:: 1.0 Da	te Analyzed:	09/08	/2010
	(N) N pH:			.1.	
CAS NO.	COMPOUND	*	CONCENTRATIO		
		<u> </u>	(ug/L or ug/		Q
100-52-7	Benzaldehyde		5.0	-	Ü
108-95-2	Phenol		5.0		ט
111-44-4	Bis (2-chloroethyl) ethe	er	5.0		U
95-57-8	2-Chlorophenol		5.0	·	Ü
95-48-7	2-Methylphenol		5.0		Ü
108-60-1	2,2'-Oxybis(1-chlorop	ropane)	5.0		Ū
98-86-2	Acetophenone		5.0		ט
106-44-5	4-Methylphenol	····	5.0		U
621-64-7	N-Nitroso-di-n-propyla	amine	5.0		Ü
67-72-1	Hexachloroethane		5,0		Ü
98-95-3	Witrobenzene		5.0		U
78-59-1	Isophorone		5.0		U
88-75-5	2-Nitrophenol		5.0		U
105-67-9	2,4-Dimethylphenol		5.0		J
111-91-1	Bis(2-chloroethoxy)met	thane	5.0		Ū
120-83-2	2,4-Dichlorophenol		5.0	·	Ū
91-20-3	Naphthalene		5,0		Ū
106-47-8	4-Chloroaniline		5.0		U
87-68-3	Hexachlorobutadiene		5.0		U
105-60-2	Caprolactam		5.0		IJ
59-50-7	4-Chloro-3-methylpheno	01	5.0		บ
91-57-6	2-Methylnaphthalene		5.0		U
77-47-4	Hexachlorocyclopentadi	Lene	5.0		U
88-06-2	2,4,6-Trichlorophenol		5.0		U
95-95-4	2,4,5-Trichlorophenol		5.0)	ָ ט
92-52-4	1,1'-Biphenyl		5.0		Ü
91-58-7	2-Chloronaphthalene		5.0)	Ū
88-74-4	2-Nitroaniline		1.0		Ū
131-11-3	Dimethylphthalate		5.0		Ũ
606-20-2	2,6-Dinitrotoluene		5.0		Ü
208-96-8	Acenaphthylene		5.0		U
99-09-2	3-Nitroaniline		10		U
83-32-9	Acenaphthene		5.0	1	Ü



1E - FORM I SV-2 SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA	SAMPLE	NO.	
	JD1N3		

Lab Name:	A4 SCIENTIFIC, INC.	Contract:	EPW0503	36
Lab Code: A4	Case No.: 40457 Mod.	. Ref No.:	SDG No.:	JD1N2
Matrix: (SOIL/S	ed/water) water	Lab Sample	ID: 00126	90-02
Sample wt/vol:	1000 (g/mL) mL	Lab File ID	:D7300	. D
Level: (LOW/MEI) LOW	Extraction:	(Type) CONT	
Moisture:	Decanted: (Y/N)	Date Receive	ed: 09/0	03/2010
Concentrated Ex	tract Volume: 1000 (uL)	Date Extrac	ted: 09/0	07/2010
Injection Volum	ne: 1.0 (uL) GPC Factor: 1.	0 Date An	alyzed: 09/0	08/2010
GPC Cleanup: (Y	/N) <u>N</u> pH:	Dilution Fac	ctor:	1.0
CAS NO.	COMPOUND		ENTRATION UNITS: L or ug/kg)ug/L	
51-28-5	2,4-Dinitrophenol		10	U
100-02-7	4-Nitrophenol		10	
132-64-9	Dibenzofuran		5.0	ט
121-14-2	2,4-Dinitrotoluene		5.0	<u>ט</u>
84-66-2	Diethylphthalate		5.0	Ū
86-73-7	Fluorene		5.0	Ū
7005-72-3	4-Chlorophenyl-phenylether		5.0	U
100-01-6	4-Nitroaniline		10	U
534-52-1	4,6-Dinitro-2-methylphenol		10	U
86-30-6	N-Nitrosodiphenylamine (1)		5.0	Ū
95-94-3	1,2,4,5-Tetrachlorobenzene		5.0	Ū
101-55-3	4-Bromophenyl-phenylether		5.0	U,
118-74-1	Hexachlorobenzene		5.0	Ü
1912-24-9	Atrazine		5.0	Ü
87-86-5	Pentachlorophenol		10	U
85-01-8	Phenanthrene		5.0	U
120-12-7	Anthracene		5.0	Ū
86-74-8	Carbazole		5.0	Ü
84-74-2	Di-n-butylphthalate		5.0	U
206-44-0	Fluoranthene		5.0	Ū
129-00-0	Pyrene		5.0	Ū
85-68-7	Butylbenzylphthalate		5.0	Ū
91-94-1	3,3'-Dichlorobenzidine		5.0	U
56-55-3	Benzo (a) anthracene		5.0	U
218-01-9	Chrysene		5.0	Ū
117-81-7	Bis(2-ethylhexyl)phthalate		5.0	Ū
117-84-0	Di-n-octylphthalate		5.0	Ū.
205-99-2	Benzo (b) fluoranthene		5.0	U
207-08-9	Benzo (k) fluoranthene		5.0	U
50-32-8	Benzo (a) pyrene		5.0	Ü
193-39-5	Indeno (1,2,3-cd) pyrene		5.0	U
53-70-3	Dibenzo (a,h) anthracene		5.0	Ü
191-24-2	Benzo (g,h,i) perylene		5.0	<u></u>
58-90-2	2,3,4,6-Tetrachlorophenol		5.0	U

1K - FORM I SV-TIC SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

JD1N3

							L		
La	ab Name:	A4 SCIENTIFIC	, INC.		Contr	act:		EPW050	36
La	ab Code: A4	Case No.:	40457	Mod. Rei	No.:		SDG N	io.:	JD1N2
Ма	atrix: (SOIL/SE	O/WATER)	WATER		Lab S	ample ID:	;	00126	90-02
Sa	ample wt/vol:	1000 (g/mL)	mī		Lab F	ile ID:		D730	0.D
Le	evel: (TRACE or	LOW/MED)	LOW		Extra	ction: (1	lype):	CONT	
<u>0</u>	Moisture:	Decanted:	(Y/N)		Date	Received:		09/03	/2010
Co	oncentrated Exti	ract Volume:	1000	(uL)	Date	Extracted	1:	09/0	7/2010
In	njection Volume:	1.0 (uL) G	PC Factor:	1.0	_ Dat	e Analyz	ed:	09/0	8/2010
GP	C Cleanup: (Y/N	N) N pH:			- Dilut	ion Facto	r:		1.0
	NCENTRATION UNI								
	CAS NUMBER		OMPOUND NA	ME		RT	EST.	CONC.	ΓΩ
01		Unknown-01	····			0.98	77	4	JN
02		Unknown-02				1.05		14	T J
03						1.09			
04		Unknown-03						.2	J
-		Unknown-04				1,15	7	, b	J
05		Unknown-05				7.64	Z	. 6	Jahn
	10544-50-0	Cyclic octa		ur		10.51		. 6	JN
7		Unknown-06	(15.01)			15.13	2	.2	JN
08									
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E	966796 ²	Total Alkane	S			N/A			

 2 EPA-designated Registry Number.

1D - FORM I SV-1 SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

JDln4

Lab Name: 2	A4 SCIENTIFIC, INC.	Contra		EPW05036	
Lab Code: A4	Case No.: 40457	Mod. Ref No.	: SDC	No.:	JD1N2
	ED/WATER) WATER		ample ID:		
Sample wt/vol:	1000 (g/mL) mL	- Lab F:	ile ID:	D7306.I)
Level: (LOW/MED) LOW	Extra	ction: (Type)	CONT	
Moisture:	Decanted: (Y/N)	Date I	Received:	09/03	/2010
	tract Volume: 1000		Extracted:		
Injection Volume	e: 1.0 (uL) GPC Factor	: 1.0 Da	te Analvzed:	09/08	/2010
	/N) N pH:	-		1.	
			CONCENTRATIO	N UNITS:	
CAS NO.	COMPOUND		(ug/L or ug/		Q
100-52-7	Benzaldehyde		5.0)	Ü
108-95-2	Phenol		5.0)	Ū
111-44-4	Bis(2-chloroethy1)ethe	er	5.0)	Ü
95-57-8	2-Chlorophenol		5.0)	Ŭ
95-48-7	2-Methylphenol		5.0)	U
108-60-1	2,2'-Oxybis(1-chlorop)	ropane)	5.0)	U
98-86-2	Acetophenone		5.0)	Ü.
106-44-5	4-Methylphenol	,	5.0)	Ū
621-64-7	N-Nitroso-di-n-propyla	amine	5.0)	Ü
67-72-1	Hexachloroethane		5.0		U
98-95-3	Nitrobenzene		5.0		Ŭ
78-59-1	Isophorone		5.0		Ψ
88-75-5	2-Nitrophenol		5.0		U
105-67-9	2,4-Dimethylphenol		5.0	l	Ū
111-91-1	Bis(2-chloroethoxy)met	hane	5.0		U
120-83-2	2,4-Dichlorophenol		5.0		U
91-20-3	Naphthalene		5.0		U
106-47-8	4-Chloroaniline		5.C		U
87-68-3	Hexachlorobutadiene		5.0		U
105-60-2	Caprolactam		5.0		U
59-50-7	4-Chloro-3-methylpheno	01	5.0		U
91-57-6	2-Methylnaphthalene		5.0		Ū
77-47-4	Hexachlorocyclopentadi	ene	5.0		Ū
88-06-2	2,4,6-Trichlorophenol		5.0		Ū
95-95-4	2,4,5-Trichlorophenol		5.0		Ū
92-52-4	1,1'-Biphenyl		5.0		ΰ.
91-58-7	2-Chloronaphthalene	, , , , , , , , , , , , , , , , , , ,	5.0		Ū
88-74-4	2-Nitroaniline		10		Ū
131-11-3	Dimethylphthalate		5.0		U
606-20-2	2,6-Dinitrotoluene		5.0		Ū
208-96-8	Acenaphthylene		5.0		Ū
99-09-2	3-Nitroaniline		10	H 1, 8 1	<u>ט</u>
83-32-9	Acenaphthene		5.0		Ū

1E - FORM I SV-2 SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

JD1N4

Lab Name: 7	44 SCIENTIFIC, INC.	Contra	nct:	EPW05036	
Lab Code: A4	Case No.: 40457	Mod. Ref No.	:sDG	No.:	JD1N2
Matrix: (SOIL/SE	D/WATER) WATER	Lab Sa	umple ID:	0012690	-03
Sample wt/vol:	1000 (g/mL) mL	Lab Fi	le ID:	D7306.E)
Level: (LOW/MED)	TOM	Extrac	ction: (Type)	CONT	
% Moisture:	Decanted: (Y/N)	Date F	Received:	09/03,	/2010
Concentrated Ext	tract Volume: 1000	(uL) Date E	Extracted:	09/07	/2010
Injection Volume	: 1.0 (uL) GPC Factor	: 1.0 Da	ate Analyzed:	09/08.	/2010
GPC Cleanup: (Y/	N) N pH:	Diluti	on Factor:	1,	0
CAS NO.	COMPOUND		CONCENTRATIO		Q
51-28-5	2,4-Dinitrophenol		10		U
100-02-7	4-Nitrophenol		10		U
132-64-9	Dibenzofuran		5.0	······································	Ū
121-14-2	2,4-Dinitrotoluene		5.0		U
84-66-2	Diethylphthalate		5.0		Ū
86-73-7	Fluorene		5.0		U
7005-72-3	4-Chlorophenyl-phenyl	ether	5.0		Ū
100-01-6	4-Nitroaniline		10		Ū
534-52-1	4,6-Dinitro-2-methylph	nenol	10		U
86-30-6	N-Nitrosodiphenylamine		5.0		<u>י</u>
95-94-3	1,2,4,5-Tetrachlorober		5.0	************************************	U
101-55-3	4-Bromophenyl-phenylet		5.0		Ü
118-74-1	Hexachlorobenzene		5.0	***************************************	U
1912-24-9	Atrazine		5.0		<u>י</u>
87-86-5	Pentachlorophenol		10		U
85-01-8	Phenanthrene		5.0		U
120-12-7	Anthracene	***************************************	5.0		U
86-74-8	Carbazole		5.0	***************************************	U
84-74-2	Di-n-butylphthalate		5.0		Ū
206-44-0	Fluoranthene		5.0		Ū
129-00-0	Pyrene		5.0		U
85-68-7	Butylbenzylphthalate		5.0		U
91-94-1	3,3'-Dichlorobenzidine	2	5.0		U
56-55-3	Benzo (a) anthracene		5.0		Ü
218-01-9	Chrysene		5.0		U
117-81-7	Bis(2-ethylhexyl)phtha	late	5.0	***************************************	Ū.
117-84-0	Di-n-octylphthalate		5.0		U
205-99-2	Benzo (b) fluoranthene	9	5.0		U
207-08-9	Benzo (k) fluoranthene)	5.0		Ü
50-32-8	Benzo (a) pyrene		5.0		Ü
193-39-5	Indenc (1,2,3-cd) pyre		5.0		U
53-70-3	Dibenzo (a,h) anthrace		5.0		U
191-24-2	Benzo (g,h,i) perylene		5.0		Ū
58-90-2	2,3,4,6-Tetrachlorophe	enol	5.0		Ū

¹Cannot be separated from Diphenylamine



1K - FORM I SV-TIC SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

Ē	PA	SAMPLE	NO.	
		JD1N4		

Lab Name:	A4 SCIENTIFIC, INC.	_ C	ontract:	EPW050	36
Lab Code: A4	Case No.: 40457	Mod. Ref 1	No.:	SDG No.:	JD1N2
Matrix: (SOIL/SE	D/WATER) WATER	L	ab Sample ID:	0012	590-03
Sample wt/vol:	1000 (g/mL) mL				
	LOW/MED) LOW				
				09/03	3/2010
Concentrated Ext	ract Volume: 1000	(uL) Da	ate Extracted	1; 09/0	7/2010
Injection Volume	: 1.0 (uL) GPC Factor:	1.0	Date Analyze	ed: 09/0	8/2010
GPC Cleanup: (Y/	N) N pH:	D:	ilution Facto	or:	1.0
CONCENTRATION UN	ITS: (ug/L or ug/kg)	ug/L			, , , , , ,
CAS NUMBER	COMPOUND NA	AME	RT	EST. CONC.	Q
01	Unknown-01 (2.53)			7.2	JN
02	Unknown-02 (2.53)		1.03	7.9	Jj
03	Unknown-03 (2.53)		1.10	3.0	J
04	Unknown~04 (2.53)		1.15	7.9	J.L
05					
06			-		
07					
08					
09					
10					
11					
12					
13					
14		***************************************		·	
15 16					
1.7		<u> </u>			
18					
19					
20					
21	· · · · · · · · · · · · · · · · · · ·				
22			-		
23				**************************************	1
24	рим. 1	***************************************			
25				*	
26					
27					
28					,
29					
30					
E966796 ²	Total Alkanes		N/A		

²EPA-designated Registry Number.



1D - FORM I SV-1 SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

JD1N5

Lab Name:	A4 SCIENTIFIC, INC.	Contract:		EPW05036		
Lab Code: A4	Case No.: 40457 Mc	od. Ref No.:	SDG	No.;	JD1N2	
Matrix: (SOIL/S	ed/water) water	Lab Sa	mple ID:	001259	0-04	
Sample wt/vol:	1000 (g/mL) mL	Lab Fi	le ID:	D7307.	D	
Level: (LOW/MED) LOW	Extract	tion: (Type)			
Moisture:	Decanted: (Y/N)	Date Re	eceived:	09/03	3/2010	
	tract Volume: 1000 (uI				7/2010	
	e: 1.0 (uL) GPC Factor:					
	/N) N pH:	A-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1	on Factor:		.0	
CAS NO.	COMPOUND		CONCENTRATIO			
			(ug/L or ug/		Q	
100-52-7	Benzaldehyde		5.0		Ü	
108-95-2 111-44-4	Phenol	*****	5.0		<u>"</u>	
95-57-8	Bis (2-chloroethyl) ether	···	5.0		U	
95-48-7	2-Chlorophenol		5.0		U	
108-60-1	2-Methylphenol		5.0		U	
98-86-2	2,2'-Oxybis(1-chloroprope	ane)	5.0		U	
106-44-5	Acetophenone		5.0		Ü	
621-64-7	4-Methylphenol N-Nitroso-di-n-propylamin		5.0		U	
67-72-1	Hexachloroethane	74	5.0			
98-95-3	Nitrobenzene		5.0		U	
78-59-1	Isophorone		5.0		U	
88-75-5	2-Nitrophenol		5.0		_	
105-67-9	2,4-Dimethylphenol				ŭ	
111-91-1			5.0		Ū	
120-83-2	Bis(2-chloroethoxy)methane 2,4-Dichlorophenol		5.0		Ū	
91-20-3	Naphthalene		5.0		<u>U</u>	
106-47-8	4-Chloroaniline		5.0		U	
87-68-3	Hexachlorobutadiene		5.0		U	
105-60-2	Caprolactam		5.0 5.0		U	
59-50-7	4-Chloro-3-methylphenol		5.0		T U	
91-57-6	2-Methylnaphthalene		5.0		1 0	
77-47-4	Hexachlorocyclopentadiene		5.0		U	
88-06-2	2,4,6-Trichlorophenol	,	5.0		1 0 1	
95-95-4	2,4,5-Trichlorophenol		5.0		U	
92-52-4	1,1'-Biphenyl		5.0		TI TI	
91-58-7	2-Chloronaphthalene		5.0		U	
88-74-4	2-Nitroaniline		10			
131-11-3	Dimethylphthalate'		5.0			
606-20-2	2,6-Dinitrotoluene		5.0		U	
208-96-8	Acenaphthylene		5.0		 U	
99-09-2	3-Nitroaniline		10	——————————————————————————————————————	U	
83-32-9	Acenaphthene		5.0	*************************************	T U	
1	g		~ + 4/			

1E - FORM I SV-2 SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

JD1N5

Lab Name:	A4 SCIENTIFIC, INC.	Contract:		EPW05036	
Lab Code: A4	Case No.: 40457 Mod.	Ref No.:	SDG 1	No.:	JD1N2
Matrix: (SOIL/	SED/WATER) WATER	Lab Sample	e ID:	0012690	-04
Sample wt/vol:	1000 (g/mL) mL	Lab File :	ID:	D7307.D)
Level: (LOW/ME)	D) LOW	Extraction	n: (Type) Co	ONT	
% Moisture:	Decanted: (Y/N)	Date Rece:	ived:	09/03,	/2010
Concentrated E	xtract Volume: 1000 (uL)	Date Extra	acted:	09/07,	/2010
Injection Volu	me: 1.0 (uL) GPC Factor: 1.	0 Date 2	Analyzed:	09/08,	/2010
GPC Cleanup: (Y/N) N pH:	Dilution D	Factor:	1.	0
CAS NO.	COMPOUND	,	NCENTRATION g/L or ug/kg		Q
51-28-5	2,4-Dinitrophenol		10		U
100-02-7	4-Nitrophenol		10		U
132-64-9	Dibenzofuran		5.0	***	U
121-14-2	2,4-Dinitrotoluene		5.0		U
84-66-2	Diethylphthalate		5.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	U
86-73-7	Fluorene		5.0	***************************************	Ū
7005-72-3	4-Chlorophenyl-phenylether		5.0		U
100-01-6	4-Nitroaniline		10		Ü
534-52-1	4,6-Dinitro-2-methylphenol		10		U
86-30-6	N-Nitrosodiphenylamine (1)		5.0		ט
95-94-3	1,2,4,5-Tetrachlorobenzene		5.0		Ü
101-55-3	4-Bromophenyl-phenylether		5.0		υ
118-74-1	Hexachlorobenzene		5.0		Ü
1912-24-9	Atrazine		5.0		U
87-86-5	Pentachlorophenol		10		U
85-01-8	Phenanthrene		5.0		Ū
120-12-7	Anthracene		5.0		Ū
86-74-8	Carbazole		5.0		Ū
84-74-2	Di-n-butylphthalate		5.0		Ü
206-44-0	Fluoranthene		5.0		Ū
129-00-0	Pyrene		5.0		Ŭ
85-68-7	Butylbenzylphthalate		5.0		U
91-94-1	3,3'-Dichlorobenzidine		5.0		บ
56-55-3	Benzo (a) anthracene		5.0		Ū
218-01-9	Chrysene		5.0		Ū
117-81-7	Bis(2-ethylhexyl)phthalate		5.0		Ū
117-84-0	Di-n-octylphthalate		5.0		<u>י</u>
205-99-2	Benzo (b) fluoranthene		5.0		Ü
207-08-9	Benzo (k) fluoranthene		5.0		Ü
50-32-8	Benzo (a) pyrene		5.0		Ü
193-39-5	Indeno (1,2,3-cd) pyrene		5.0		Ū
53-70-3	Dibenzo (a,h) anthracene		5.0		Ū
191-24-2	Benzo (g,h,i) perylene		5.0		Ū
58-90-2	2,3,4,6-Tetrachlorophenol		5.0		Ü

¹Cannot be separated from Diphenylamine

11/19/10

000000230

1K - FORM I SV-TIC SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET TENTATIVELY IDENTIFIED COMPOUNDS

EPA	SAMPLE	NO.
	JD1N5	

Lab Name:	A4 SCIENTIFIC, INC.	Contract:		EPW05036			
Lab Code: A4	Case No.: 40457	Mod. Ref					
Matrix: (SOIL/SE	ID/WATER) WATER		Lab S	ample ID:	;	00126	90-04
Sample wt/vol: _	1000 (g/mL) mL			ile ID:		D7307	
Level: (TRACE or	LOW/MED) LOW		Extra	ction: (1	(ype):	CONT	
			Date :	Received:	:	09/03	/2010
Concentrated Ext	ract Volume: 1000	(uL)	Date 1	Extracted	ì:	09/07	'/2010
Injection Volume: 1.0 (uL) GPC Factor:		: 1.0	Dat	e Analyz	ed: 09/08/2010		
GPC Cleanup: (Y/	N) N pH:	Dilution Factor			r: 1.0		
CONCENTRATION UN	ITS: (ug/L or ug/kg)	ug/L	_		- ,-		
CAS NUMBER	COMPOUND N	AME	1	RT	EST.	CONC.	Q
01	Unknown-01 (2.53)			0.98	****		JN
02	* Unknown-02 (2.53)			1.03		. 0	J J
03	Unknown-03 (2.53)			1.10	2.	. 7	Ĵ
04	Unknown-04 (2.53)			1.15	8.	. 9	ŢĹ
05					·····		
D6							
07					****		
08		-					
09			-				
10				·			
11 12							
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24							
25 26							
27							
28					~~. <u></u>		
29		************					
30							
E966796 ²	Total Alkanes		-	N/A			

²EPA-designated Registry Number.

1G - FORM I PEST PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

JD1N3

Lab Name: A	4 SCIENTIFIC, INC.	Contract:		EPW05036	
Lab Code: A4	Case No.: 40457	Mod. Ref No.:		SDG No.:	JD1N2
Matrix: (SOIL/SE	D/WATER) WATER	Lab Sa	mple ID:	0012690-	-02
Sample wt/vol:	1000 (g/mL) mL	- Tab Pi	le TD:	C37875.1	
-	(3), 1112)	-			
% Moisture:	Decanted: (Y/N)	Date R	eceived:	09/03/20	010
Extraction: (Typ	e) SEPF	Date E	xtracted:	09/03/2	010
Concentrated Ext	ract Volume: 10000	(uL) Date A	nalyzed:	09/13/20)10
Intection Volume	: 1.0 (uL) GPC Factor	- er 1.0 541	- lution Fac	tor: 1	.0
GPC Cleanup: (Y/	N) N pH:	Sulfur	Cleanup:	(Y/N)	N
CAS NO.	COMPOUND			TION UNITS:	Q
319-84-6	alpha-BHC		 	0.050	U
31.9-85-7	beta-BHC			0.050	ט
319-86-8	delta-BHC			0.050	U
58-89-9	gamma-BHC (Lindane)		 	0.050	U
76-44-8	Heptachlor			0.050	Ū
309-00-2	Aldrin		-	0.050	U
1024-57-3	Heptachlor epoxide		***************************************	0.050	U
959-98-8	Endosulfan I			0.050	ט
60-57-1	Dieldrin			0.10	Ū
72-55-9	4,4'-DDE	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		0.10	Ū
72-20-8	Endrin		***************************************	0.10	Ū
33213-65-9	Endosulfan II			0.10	U
72-54-8	4,4'-DDD		*******	0.10	Ü
1031-07-8	Endosulfan sulfate			0.10	Ū
50-29-3	4,4'-DDT			0.10	Ū
72-43-5	Methoxychlor			0.50	U
53494-70-5	Endrin ketone	,	******	0.10	Ū.
7421-93-4	Endrin aldehyde			0.10 .	ט
5103-71-9	alpha-Chlordane			0.050	ΰ
5103-74-2	gamma-Chlordane			0.050	Ū
0001 00 0	MM 2 2			F 0	

1G - FORM I PEST PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

				l	
ab Name:	A4 SCIENTIFIC, INC.	_ Contra	ct:	EPW0503	6
ab Code: A4	Case No.: 40457	Mod. Ref No.:		SDG No.:	JD1N2
atrix: (SOIL/	SED/WATER) WATER	Lab Sa	mple ID:	001269	90-03
ample wt/vol:	1000 (g/mL) mL	- Lab Fi	le ID:	C37871	B.D
				00/00	20040
morsture:	Decanted: (Y/N)	Date R	eceived:	09/03,	/2010
xtraction: (T	ype) SEPF	Date E	xtracted:	09/03	/2010
oncentrated E	xtract Volume: 10000	(uL) Date A	nalyzed:	09/13/	2010
njection Volu	me: 1.0 (uL) GPC Factor	r: 1.0 Dil	- lution Fac	tor:	1.0

C Cleanup: ()	Y/N) N pH:	Sulfur	Cleanup:	(Y/N)	N
CAS NO.	COMPOUND			TION UNITS: ug/kg)ug/L	Ω
319-84-6	alpha-BHC			0.050	Ü
319-85-7	beta-BHC			0.050	U
319-86-8	delta-BHC			0.050	Ū
58-89-9	gamma-BHC (Lindane)			0.050	U
76-44-8	Heptachlor			0.050	, U
309-00-2	Aldrin			0.050	Ü
1024-57-3	Heptachlor epoxide			0.050	IJ
959-98-8	Endosulfan I			0.050	IJ
60-57-1	Dieldrin			0.10	U
72-55-9	4,4'-DDE			0.10	U
72-20-8	Endrin			0.10	ט
33213-65-9	Endosulfan II			0.10 ·	Ū
72-54-8	4,4'-DDD .			0.10	Ü
1031-07-8	Endosulfan sulfate			0.10	ט
50-29-3	4,4*-DDT			0.10	Ū
72-43-5	Methoxychlor			0.50	U
53494-70-5	Endrin ketone		·	0.10	Ū
7421-93-4	Endrin aldehyde			0.10	Ū
5103-71-9	alpha-Chlordane			0.050	U
5103-74-2	gamma-Chlordane			0.050	U
8001-35-2	Toxaphene			5.0	TT .

1G - FORM I PEST PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

				ı u	DINO
Lab Name:	A4 SCIENTIFIC, INC.	Contra	ct:	EPW05036	
Lab Code: A4	Case No.: 40457	Mod. Ref No.:	SDG	No.:	JD1N2
Matrix: (SOIL/S	SED/WATER) WATER	- Lab Sa	mple ID:	0012690-	-04
Sample wt/vol:	1000 (g/mL) mL	 Lab Fi	le ID:	C37879.:	D
% Moisture:	Decanted: (Y/N)	- Date R	eceived:	09/03/26	010
Extraction: (T)	pe) SEPF	Date E	xtracted:	09/03/2	010
•	stract Volume: 10000	- (uL) Date A	nalvzed:	09/13/20	010
	ne: 1.0 (uL) GPC Facto	****			.0
GPC Cleanup: (%	der de server en en de de sela de la companya de la		Cleanup: (Y/N)		N
CAS NO.	COMPOUND		CONCENTRATION (ug/L or ug/kg		Q
319-84-6	alpha-BHC	William "	0.050)	U
319-85-7	beta-BHC	*********	0.050		ט
319-86-8	delta-BHC		0.050)	U
58-89-9	gamma-BHC (Lindane)		0.050)	υ
76-44-8	Heptachlor		0.050)	ט
309-00-2	Aldrin		0.050)	Ü
1024-57-3	Heptachlor epoxide		0.050)	U
959-98-8	Endosulfan I	····	0.050)	U
60-57-1	Dieldrin		0.10		Ü
72-55-9	4,4'-DDE		0.10		Ū
72-20-8	Endrin		0.10		Ū
33213-65-9	Endosulfan II	<u>.</u>	0.10		Ü
72-54-8	4,4'-DDD		0.10		U
1031-07-8	Endosulfan sulfate		0.10		Ü
50-29-3	4,4'-DDT		0.10		U
72-43-5	Methoxychlor		0.50		IJ
53494-70-5	Endrin ketone		0.10		ט
7421-93-4	Endrin aldehyde		0.10		Ū
5103-71-9	alpha-Chlordane	***	0.050	J	Ū
5103-74-2	gamma-Chlordane	*******	0.050		ש
8001-35-2	Toxaphene		5.0		71

1H - FORM I ARO AROCLOR ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

JD1N3

Lab Name:	A4 SCIENTIFIC,	INC.	.	Contrac	tt	EPW05036	
Lab Code:A	4 Case No.:	40457	Mod.	Ref No.:	SDO	3 No.:	JD1N2
Matrix: (SOIL	/sed/water)	WATER		Lab Sam	ole ID:	0012690)-02
Sample wt/vol	: 1000 (g/mL)) mL	.	Lab Fil	e ID:	F22562	. D
% Moisture:	Decanted	: (Y/N)	-	Date Re	ceived:	09/03/2	2010
Extraction: ('	rype) SEP	F		Date Ex	racted:	09/03/	2010
Concentrated 1	Extract Volume:	10000	(uL)	Date Ana	alyzed:	09/13/2	2010
Injection Vol	me: <u>1.0</u> (uL) G	PC Facto	r: 1	.0 Dilu	tion Factor		1.0
GPC Cleanup:	(Y/N) N pH		73.5711100	Sulfur (Cleanup: (Y/	N)	N
ACID Cleanup:	(Y/N) Y		-			-	
CAS NO.	COMPOUND		·····		CONCENTRATIO		Q
12674-11-2	AR1016				1.	٥	U
11104-28-2	AR1221				1.	0	U
11141-16-5	AR1232				1.	0	U
53469-21-9	AR1242				3	0 .	U
12672-29-6	AR1248				l.	0	ט 📗
11097-69-1	AR1254				1.	0	ט
11096-82-5	AR1260				J	0	U
37324-23-5	AR1262				1.	0	Ü
11100-14-4	AR1268				1.	0	U

1H - FORM I ARO AROCLOR ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

JD1N4

							l l	
Lab Name	:	4 SCIENTIFIC,	INC.		Contra	ct:	EPWC503	6
Lab Code	: A4	Case No.:	40457	Mod.	Ref No.:		SDG No.:	JD1N2
Matrix:	(SOIL/S	D/WATER)	WATER		Lab Sa	mple ID:	001269	90-03
Sample w	t/vol:	1000 (g/m	L) mL	_	Lab Fi	le ID:	F2256	5.D
% Moistu	re:	Decante	d: (Y/N)	_	Date R	eceived:	09/03	/2010
Extracti	on: (Typ	oe) SE	PF		Date E	- xtracted:	09/03	/2010
Concentr	ated Ext	ract Volume:	10000	- (uL)	Date A	nalyzed:	09/13/	/2010
Injectio	n Volume	: 1.0 (uL)	GPC Facto	r: 1	.0 Di	 lution Fac	tor:	1.0
GPC Clea	ոսթ։ (Կ	/N) N p	H:		Sulfur	Cleanup:	(Y/N)	N
ACID Cle	anup: (Y	(N) Y						
CAS NO) .	COMPOUND					TION UNITS:	Ω
12674-	11-2	AR1016					1.0	U U
11104-	28-2	AR1221					1.0	U
11141-	16-5	AR1232					1.0	U
53469-	21-9	AR1242					1.0	. ש
12672-	29-6	AR1248		A			1.0	U
11097-	69-1	AR1254					1.0	σ
11096-	82-5	AR1260					1.0	U
37324-	23-5	AR1262					1.0	U
11100-	14-4	AR1268					1.0	ט

1H - FORM I ARO AROCLOR ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO. JD1N5

									0.	U.M.U.
Lab Name:	F	4 SCIENTIFI	C, INC	•		Contra	ot:	El	PW05036	
Lab Code:	A4	Case No.:	404	157	Mod.	Ref No.:		SDG No	o.:	JD1N2
Matrix: (S	OIL/SE	D/WATER)	WAT	ER		Lab Sax	mple ID:		0012690-	-04
Sample wt/	vol:	1000 (g	/mL)	mL		Lab Fi	le ID:		F22566.1)
% Moisture	::	Decan	ted: (Y/N)		Date Re	eceived:		09/03/20	olo
Extraction	: (Typ	oe)	SEPF			_ Date E:	xtracted:		09/03/2	010
Concentrat	ed Ext	ract Volume	: 1	0000	(uL)	Date A	nalyzed:	****	09/13/20	010
Injection	Volume	1.0 (uI) GPC	Facto	r: 1	_O Dil	ution Fac	tor:	1	.0
GPC Cleanu	ıp: ()	:/N) N	pH:			Sulfur	Cleanup:	(Y/N)		N
ACID Clear	աթ։ (չ	Y (N\)	***************************************							
CAS NO.		COMPOUND					CONCENTRA			Q
12674-11	1-2	AR1016			····			1.0		U
11104-2	3-2	AR1221 .						1.0	77.17.11.11.11.11.11.11.11.11.11.11.11.1	ט
11141-1	5-5	AR1232						1.0		U
53469-2	1-9	AR1242						1.0		Ū
12672-21	9-6	AR1248						1.0		U
11097-6	9-1	AR1254						1.0		Ū
11096-82	2-5	AR1260						1.0		ט
37324-23	3-5	AR1262						1.0		ט
11100-14	1 4	AR1268						1.0		77



MEMORANDUM

DATE:

October 13, 2010

TO:

Jeff Fetters, START-3 Project Manager, E & E, Seattle, Washington

FROM:

Mark Woodke, START-3 Chemist, E & E, Seattle, Washington

SUBJ:

Data Summary Check,

South Tacoma Seep Site, Tacoma, Washington

REF:

TDD: 10-05-0004

PAN: 002233.0569.01SI

The data summary check of 3 water samples collected from the South Tacoma Channel Seep site located in Tacoma, Washington, has been completed. Total elements (ICP-MS and CVAA) analyses were performed by A4 Scientific, The Woodlands, Texas.

The samples were numbered:

MJD1N3

MJD1N4

MJD1N5

No discrepancies were noted. Sample results originally qualified as "Q" by the primary data reviewer were changed to "JQ" by the secondary reviewer to indicate that the results were estimated below the contract required quantitation limit. Sample results originally qualified as "UJ" by the primary data reviewer to indicate that the sample quantitation limit was estimated due to initial calibration standards outside the \pm 30% difference window were qualified "UJK" by the secondary reviewer to indicate that the sample quantitation limit was estimated with an unknown bias.

ON VOERICE CONTRACTOR OF THE STATE OF THE ST

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION 10

1200 Sixth Avenue, Suite 900 Seattle, WA 98101-3140

October 5, 2010

Reply To

Attn. Of: **OEA-095**

MEMORANDUM

SUBJECT: Data Validation Report for Metals Analysis of Water Samples Collected for the South

Tacoma Seep Site Inspection - Case 40457, SDG: MJD1N3

FROM: Donald Matheny, Chemist

USEPA R10, OEA, Environmental Services Unit

TO: Brandon Perkins, Site Assessment Manager

Office of Environmental Clean-up, USEPA R10 (ECL-112)

CC: Renee Nordeen, Ecology & Environment

The quality assurance (QA) review of the analytical data generated from the analysis of three (3) water samples collected from the above referenced site has been completed. These samples were analyzed for total metals by A4 Scientific, located in the Woodlands, Texas.

All sample analyses were evaluated following EPA's Stage 4 Data Validation Electronic/Manual Process (S4VEM). The validation was conducted according to the Quality Control Specifications outlined in the Sampling & Quality Assurance Project Plan for the South Tacoma Channel Seep (July, 2010), the specifications of the EPA Contract Laboratory Program's (CLP) Statement of Work (SOW) for Multi-Media, Multi-Concentration Inorganic Analyses (ISM01.2), the Contract Laboratory Program's National Functional Guidelines for Inorganic Data Review, and the Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use (EPA-540-R08-005). Some data may be qualified using the reviewer's professional judgment. The conclusions presented herein are based on the information provided for the review.

A summary of samples evaluated in this validation report and the pertinent dates for sample collection, sample receipt at the laboratory, extraction and analyses is attached along with the validated data.

I. QUALITY CONTROL RESULTS SUMMARY

Quality Control Test	Result Ranges	Outliers?	Evaluation Criteria		
LCS (blank spike)	88 – 111%	N	70 - 30%; (Ag, Sb 50 - 150%)		
Blanks	Within criteria	Y*	Non-detect or <10% of Sample		
Sample Duplicate (MJD1N3)	± CRQL	N	≤ 20% RPD or ± CRQL		
Matrix Spike (MJD1N3)	89 - 111%	Y*	75 - 125%		
Serial Dilution (MJD1N3)	≤1%	N	≤ 10%-		

^{*}See the "Data Qualifications" section below for excursions and qualification of affected data.

II. DATA QUALIFICATIONS

Summary of Validation Qualifiers Applied

After the manual and electronic data review, the following data qualifications were applied:

Blanks	Mercury, ICP_AES
ND04	The following samples have analyte results greater than or equal to MDLs but less than CRQLs. The associated CCB analyte results are greater than or equal to MDLs but less than or equal to CRQLs. Detected analytes are qualified U. Non-detected analytes are not qualified. Sample results are elevated at CRQLs.
	Mercury - All Samples Iron - MJD1N5
Detection Limit	TCP_AES
NDL1	The following samples have results greater than or equal to MDLs but less than CRQLs. Detected analytes are qualified Q.
	Potassium - All Samples Manganese - MJD1N5
Initial Calibration	ICP_ATS
NB033	The following ICP-AES samples are associated with initial calibration standards that have analyte %D outside -30 to 30% window. Non-detected analytes are qualified UJ.
	Copper - All Samples
Matrix Spikes	ICP_AES
NG11	The following Matrix Spike samples have percent recoveries in the range of 30-74% and post-digestion spike samples have percent recoveries greater than or equal to 75% (not required for Ag). Nondetected analytes are qualified UJL. Values may be biased low.
	Silver - All Samples

Data Qualifiers

The following is a list of validation qualifiers applied to the sample result(s) when needed to indicate associated out-of-control QA/QC results.

	Data Qualifiers								
Ū	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.								
J	The associated value is an estimated quantity.								
UJ	The analyte was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.								
R	The data are unusable. The analyte may or may not be present in the sample.								
	Project Specific Data Qualifiers								
L	Low bias.								
H	High bias.								
K	Unknown Bias.								
Q	Detected concentration is below the method reporting limit / Contract Required Quantitation Limit, but is above the method detection limit.								

III. SAMPLE INDEX

Sample Number	Matrix	Sämpling	Date	deterministrationalaritet patrifit inception	Analysis	e efferiefenen et et et fene iftille en ein fleitellief	y Analysis
Number	1.7	Date	Received	Prep. Date	Analysis Date	Prep. Date	Analysis Date
MJD1N3	Water	09/01/2010	09/03/2010	09/20/2010	09/ 21–23 /2010	09/14/2010	09/14/2010
MJD1N4	Water	09/01/2010	09/03/2010	09/20/2010	09/ 21–23 /2010	09/14/2010	09/14/2010
MJD1N5	Water	09/01/2010	09/03/2010	09/20/2010	09/ 21–23 /2010	09/14/2010	09/14/2010

Case No: 40457	Contract: EPW098	35	SDG No:	MJD1N3	Lab Code:	A4
Sample Number: MJD1N3	Method	: ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location: SP01GW	pH:	1.5	Sample Date:	09012010	Sample Time:	['] 09:40:00
% Moisture:			% Solids:			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	200	ug/L	1	UN	U	Yes	S4VEM
Antimony	60.0	ug/L	1	V	U	Yes	S4VEM
Arsenic	10,0	ug/L	1	. ф	U	Yes	S4VEM
Barium	200	ug/L	1	ц	υ	Yes	S4VEM
Beryllium	, 5.0	ug/L	1	U	U	Yes	\$4VEM
Cadmium	5.0	ug/L	1	ט	υ	Yes	S4VEM
Calcium	22200	ug/L	1			Yes	S4VEM
Chromium	10.0	ug/L	1	ט	ט	Yes	S4VEM
Cobalt	50.0	ug/L	1	ט .	U	Yes	S4VEM
Copper	25.0	ug/L	1	U	υK	Yes	S4VEM
Iron	100 ·	ug/L	1	ט	U	Yes	S4VEM
Lead	10.0	ug/L	.1	U	Ŭ,	Yes	S4VEM
Magnesium	19200	ug/L	1			Yes	S4VEM
Manganese	15,0	ug/L	1	U	. ע	Yes	S4VEM
Nickel	40.0	ug/L	. 1	· U	U	Yes	S4VEM
Potassium	2680	ug/L	. 1	J	Jo	Yes	S4VEM
Selenium	35.0	ug/L	1 - 1	ч	Ū	Yes	S4VEM
Silver	10.0	ug/L	1	Uk	UIL	Yes	S4VEM
Sodium	9490	ug/L	1			Yes	S4VEM
Thallium	25.0	ug/L	1	U	Ū ·	Yes	S4VEM
Vanadium	50.0	ug/L	1	U	ט	Yes	S4VEM
Zinc	60.0	ug/L	1	U	U	Yes	S4VEM

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Case No: 40457	Contract: EPW	9035	SDG No:	MJD1N3	Lab Code;	A4	
Sample Number: MJD1N	3 Meth	od: Hg	Matrix:	Water	MA Number:	DEFAULT	
Sample Location: SP01GV	pH:	1.5	Sample Date:	09012010	Sample Time:	09:40:00	
% Moisture:			% Solids:		<u> </u>	•	

Analyte Name	Result	Units	Dilution Factor	Lab	Flag	Validation	Reportable	Validation Level
Mercury	0.20	ug/L	. 1	!	t	U	Yes	S4VEM

7/5,10

Case No: 40457	Contract	EPW09035		SDG No:	MJD1N3	Lab Code;	A4
Sample Number:	MJD1N4	Method:	ICP_AES	Matrix;	Water	MA Number:	DEFAULT
Sample Location:	SP02GW	pH:	1.5	Sample Date:	09012010	Sample Time:	10:15:00
% Moisture:				% Solids:		,	

Analyte Name	Result	Units	Dilution Factor	Lab	Validation	Reportable	Validation Level
Aluminum	. 200	ug/L	1	UN	U	Yes	S4VEM
Antimony	60.0	ug/L	1	þ	U	Yes	S4VEM
Arsenic	10.0	ug/L	1	ד	U	Yes	S4VEM
Barium	200	ug/L	1	h	יט	Yes	S4VEM
Beryllium	5.0	ug/L	1	ŋ	U	Yes	S4VEM
Cadmium	5.0	ug/L	1	þ	ָ ט	Yes	S4VEM
Calcium	18900	ug/L	1			Yes	S4VEM
Chromium	10.0	ug/L	1	ψ	U	Yes	S4VEM
Cobalt	· 50.0	ug/L	1	U	ប	Yes	S4VEM
Copper	25.0	ug/L	1	ф	υK	Yes	S4VEM ,
Iron	100	ug/L	1	U ·	. ע	Yes	S4VEM
Lead	10.0	ug/L	1	Ų	ָ ט	Yes	S4VEM
Magnesium	18200	ug/L	1			Yes	S4VEM
Manganese	15,0	ug/L	1	Ü	υ	Yes	S4VEM
Nickel	40.0	ug/L	1	U	U	Yes	S4VEM
Potassium	2520	ug/L	1	J	か	Yes	S4VEM
Selenium	35.0	uġ/L	1	Ų	υ	Yes	S4VEM
Silver	10.0	ug/L	1	UN	UJL	Yes	S4VEM
Sodium	8000	ug/L	1			Yes	S4VEM
Thallium	25.0	ug/L	1	Ų	υ	Yes	S4VEM
Vanadium	50.0	ug/L	1	υ	U	Yes	S4VEM
Zinc	60.0	ug/L	1	ų	U	Yes	S4VEM

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Case No: 404:	57	Contract:	EPW09035		SDG No:	MJD1N3	Lab Code;	A4
Sample Number:	MJD1N4		Method:	Hg	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	SP02GW		pH:	1.5	Sample Date:	09012010	Sample Time:	10:15:00
% Moisture:					% Solids:			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	0,20	ug/L	1	y	U	Yes	S4VEM

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P10,5,10

Case No: 40457	7	Contract;	EPW09035		SDG No:	MJD1N3	Lab Code:	A4
Sample Number:	MJD1N5		Method:	ICP_AES	Matrix:	Water	MA Number:	DEFAULT
Sample Location:	SP03GW		pH:	1.5	Sample Date:	09012010	Sample Time:	11:27:00
% Moisture:					% Solids:			

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Aluminum	200	ug/L	1	ŲN	U	Yes	S4VEM
Antimony	60.0	ug/L	1	Ų	U	Yes	S4VEM
Arsenic	10.0	ug/L	1	Ų	U	Yes	S4VEM
Barium	200	ug/L	1	t	Ū	Yes	S4VEM
Beryllium	5.0	ug/L	1	τi ⁻	Ū	Yes	S4VEM .
Cadmium	5.0	ug/L	1	U	ับ	Yes	S4VEM
Calcium	25000	ug/L	1			Yes	S4VEM
Chromium	10.0	ug/L	1	υ	U	Yes	S4VEM
Cobalt	50,0	ug/L	1	ט	· U	Yes	S4VEM
Copper	25.0	ug/L	. 1	ט י	U G	Yes	S4VEM
Iron	100	ug/L	_ 1	J	ָ ָם	Yes	\$4VEM
Lead	10.0	ug/L	1	U	ט	Yes	S4VEM
Magnesium	18000	ug/L	1 .			Yes	S4VEM
Manganese	13.0	ug/L	, I	4	Jo	Yes	S4VEM
Nickel	40.0	ug/L	1	ф	ט	Yes	S4VEM
Potassium	2750	ug/L	1	þ	50	Yes	S4VEM
Selenium	35.0	ug/L	1	Ū	. U	Yes	S4VEM
Silver	10.0	ug/L	1	UN	UJL	Yes	S4VEM
Sođium	11100	ug/L	· 1			Yes	S4VEM
Thallium	25.0	ug/L	1	Ц	ט	Yes	S4VEM
Vanadium	50.0	ug/L	1	U	מ	Yes	S4VEM
Zinc	60.0	ug/L	1	Ū	ט	Yes	S4VEM





Case No: 4045	7 Cont	ract: EPV	V09035		SDG No:	MJD1N3	Lab Code:	A4	
Sample Number:	MJD1N3	Me	thod: H	5	Matrix:	Water	MA Number:	DEFAULT	
Sample Location:	SP03GW	рН	: 1.5		Sample Date:	09012010	Sample Time:	11:27:00	
% Moisture:	•				% Solids:				

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable	Validation Level
Mercury	0.20	ug/L	I	J	ט	Yes	S4VEM

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